

CIVIC SPACE INSPIRED BY HAWAIIAN ALIGNMENTS: CREATING A
HAWAIIAN PRESENCE IN PU'U O KAPOLEI

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Abstract

The spirit of a place is an important element among communities, especially in those cultures that have a strong connection with the cosmos. Many ancient civilizations used the stars as referential in the placement of their structures and performing spiritual rituals among those spaces, such as the Egyptians aligning their Giza pyramid with the Orion star constellation. In *The Orion Mystery: Unlocking the Secrets of the Pyramids*, Robert Bauval discovers that the pyramid location had a strong connection between the dead king Osiris and the constellation of Orion.¹ The importance of why the Egyptians did this was reflected in Bauval's theory that there was spiritual knowledge that enlightened the pyramid builders, creating a portal between earth and the heavens. Similarly, the ancient Hawaiians have placed and built most of their temples, or *heiau*, to align with the sun's solstice and equinox at strategic locations.

Globally, there are many ancient structures that are aligned with the celestial sky, taking examples from the Forbidden City in China, to the ancient Mayan city of Uxmal. Most of these monuments themselves were built for the rulers but also functioned as a civic space that invoked a central power. In the contemporary built environment, the notion of a civic space has evolved into an extension of a community, becoming a public realm of cultural activities and knowledge. The question arises: Do these spaces invoke a traditional and cultural perspective of the indigenous culture? Case studies such as the Uluru Kata-Tjuta Cultural Center in Australia, describes the importance of indigenous culture integration within a civic space. The recognition of native culture is mostly absent in today's perception of the built environment, especially in Hawai'i. This project attempts reconciliation between traditional Hawaiian knowledge of spatial elements, cultural significance, and the tangible and intangible structure of a *heiau*, and align it with the modern civic space. Methods that accomplish these tasks include historical research, interviews, logical argumentation and case studies. The resulting collective data establishes a set of programs for designing a Hawaiian civic space.

¹ Robert Bauval, *The Orion Mystery: Unlocking the Secrets of the Pyramids* (New York, Three Rivers, 2004), 110.

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"We do not inherit the Earth from our Ancestors, we borrow it from our Children."

-Ancient Indian proverb

Introduction

This research project's overarching theme is integrating cultural views of alignments and spatial elements of a space and program structure within the modern civic space. In ancient societies, important structures of power were aligned with the planetary bodies. These places functioned on many levels, from marking seasonal changes, functioning as a meeting space, and even becoming an area for sacrificial and non-sacrificial rituals. These spaces were part of the breeding ground of indigenous knowledge and were a major component of the social interaction between the upper, middle and lower classes and their ancestors.

Utilizing indigenous cultural elements within a civic space is mostly absent in the built environment today due to the modern lifestyle. With the industrial revolution came massive production of automobiles and machinery and a way of living that allowed most people to neglect the natural and spiritual aspect of life, a significant feature of indigenous culture. The questions arise, why and how do we create a sense of place that integrates indigenous education while in relation to alignments?

Why design a civic space and what is the importance and cultural significance surrounding it? A civic space is an extension of a community and creates a realm for the public. It is meant to be a gathering place, give identity to cities, help the environment, benefit the community economically and provide a setting for both cultural and social diversion.² A community can benefit from going back to the basics, to indigenous knowledge, in the form of civic spaces that allows one to observe and live with the natural environment.

The first half of this research project is focused on the indigenous elements of alignment in civic spaces, especially showing integration of culture into the natural universe. Existing research suggests certain ancient indigenous sites and structures

² Project for Public Spaces, "What is a Great Civic Space ?", accessed March 13, 2015, <http://www.pps.org/reference/benefits_public_spaces/>

display alignments with celestial objects, especially with the sun. The second half of the project is design with the site based in Kapolei, positioned in a location where cultural importance is significant.

The goals for this project is to give consideration to respecting and expressing indigenous culture through public spaces and establish a strong educational environment for using alignments in relation to living in sustenance. The resulting civic space is designed for both the Hawaiian and non-Hawaiian communities, where a set of programmatic spaces are formed. This representation of a Hawaiian civic space serves as a design template for designers and architects who intend on constructing spaces within the Pacific region, specifically Hawai'i. For the author, this research is the start of a journey to a humbling and exciting career in becoming an architect at the local, national and international level, with hopes to contribute to the shaping of indigenous and cultural spaces in architecture and urban planning.

Research: Theory and Design

There are five chapters to this doctorate research project. Chapters 1, 2, and 3 are comprised of existing knowledge and theories that focus on the structure of civic spaces pertaining to culture and alignments. Chapter 4 focuses on analyzing case study examples of exemplary civic spaces throughout the Asia-Pacific region. Chapter 5 is the concluding chapter that encompasses chapter 1 through 4 into the design phase of the research project.

Chapter 1 focuses briefly on the research of basic forms of alignments found throughout the world. The purpose of this is to layout an understanding of why ancient civilizations applied alignment principles within their culture. Chapter 2 includes research of Pacific culture and alignments. Polynesian culture is very uniform. Information of Pacific cultures from the Samoan, Maori and Tahiti are studied to get a better understanding of the Hawaiian spatial elements and cultural significance of a heiau, specifically alignments. Chapter 3 focuses on existing knowledge by narrowing the information on how alignments with the celestial sky relate to Hawaiian culture and the

structure of the heiau. This chapter also includes information via interview from Shad Kane, cultural practitioner and care taker of Kalaeloa Heritage Park in Kapolei, emphasizing the importance of alignments in Hawaiian culture.

Chapter 4 focuses on contemporary civic spaces as it relates to alignments. The majority of these buildings are civic spaces which have multiple layers of cultural ideas that are a component of the architecture and spatial design. Critical analysis of these case studies generates programmatic guidelines that are applied in designing a Hawaiian civic space.

Chapter 5 concludes the overall project by creating a design integrating major findings taken from the previous four chapters into the chosen site (Figure 1).

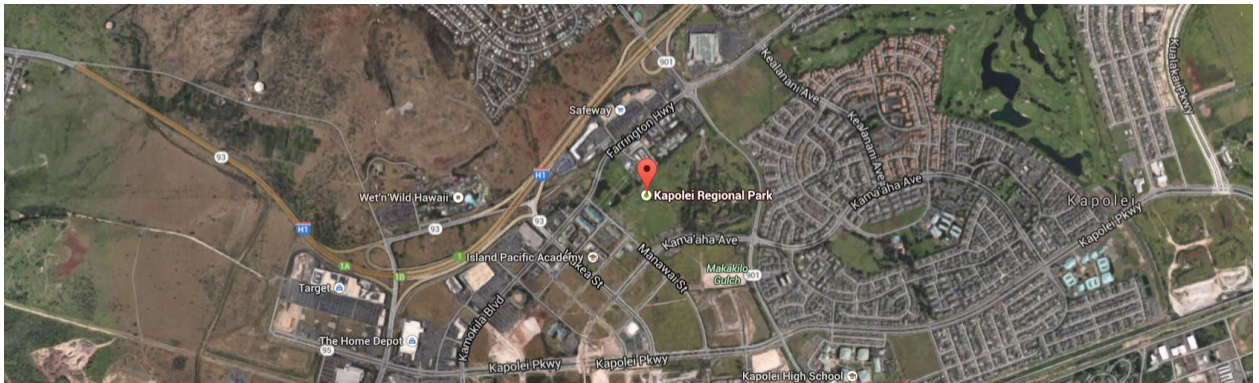


Figure 1. Site, Kapolei regional park.

Research Methodology

There are three types of research methods for this D.Arch. research project: Historical Research, Case Study, and Logical Argumentation. Chapters 1, 2, and 3 comprise of the Historical Research portion of this project and they include information from books, the internet, articles and interviews. Logical Argumentation is derived in Chapter 4 observing and critical analyzing case studies.

As part of the design research, Chapter 4, case studies, serves as an important aspect of this research project. The following four contemporary civic spaces have been analyzed:

1. Uluru-Kata Tjuta Cultural Centre in Australia,
2. Fale Pasifika in Australia,
3. Kūkaniloko in Hawaii,
4. Forbidden City in China

These spaces have both alignments and an integration of indigenous culture in the design. As part of the research, focus has been given to the design aspect of alignments and civic centers that incorporate culture within their design of the architecture, landscape and the spaces. The majority of these case studies are within contemporary architecture of the Pacific Rim. The application of this research method notes important information of certain precedents and their design schemes within the cultural, regional and site context.

Chapter 1: Orientation

Though these civilizations are more than a thousand miles apart, there are some common traits among them regarding working with principals of orientation, geometry, cosmology and alignments. It is important to briefly touch upon sacred geometry as one of the sources of global exploration of such universal practice.

Civilizations of old were observant of the stars, sun, moon and the environment around them. Most people aren't informed enough of the global similarities of civilizations that oriented their structures to the cosmos. The discovery of this knowledge did not happen in one sitting, it was generations of a civilization's drive to procreate universal knowledge.

1.1 Sacred Geometry

Sacred geometry is a western principal design using shapes and geometry to determine precise proportions and placement of certain elements or objects that are represented in the universe. *Geometry* means "the measurement of the earth"³ and according to Nigel Pennick in his book, *Sacred Geometry : Symbolism and Purpose in Religious Structure*, the practice of geometry with magic was inseparable. Oracles and Shamans would perform rituals with symbols that are associated with divinity.⁴ In principle, sacred geometry is linked with the universe.⁵ In western societies, sacred geometry is used within the design of religious structures.

Types of sacred geometry fall in the category of mathematics, angles, geometry, alignments, the flow of energy and symbolism. Ancient astrologers used these techniques to obtain knowledge of the cosmos. Geometry and alignment or orientation, are the few principles that are believed to be prevalent in its relationship with sacred geometry, as practiced by many cultures within the historical and contemporary aspect of the world. We ask ourselves, why were these design principles strictly followed to the core by these civilizations?

³ Robert Lawlor, *Sacred Geometry: Philosophy and Practice* (London : Thames & Hudson Ltd, 2002), 6.

⁴ Nigel Pennick, *Sacred Geometry: Symbolism and Purpose in Religious Structures* (San Francisco : Harper & Row, 1980),8.

⁵ Pennick, *Sacred Geometry*, 9.

1.1.1 Forms

One of the basic forms of sacred geometry is the circle. It is seen in nature, such as the sun, moon and other animals and plants. In prehistoric times, civilizations would build their structure around the form of a circle, for example the Native American *tipi* or the Mongolian *yurt*.⁶

The square is also a prime example of a sacred geometrical form representing the universe. Like the circle the square is symmetrical and when divided in four equal parts, creates a cross noting the cardinal points of north, east, south and west.⁷ Many cultures depict this sacred form within their structures, for example the Egyptian Giza pyramids and the many Cambodian temples located in Angkor.

There are also many elaborate forms that pertain to sacred geometry such as the *Vesica Piscis* and the *Platonic Solids* that other cultures around the globe used within their religious structures. These forms are concerned with cosmology and most cultures globally used both the circle and square to represent a cosmic order. Much of this concept relates to the axis mundi, as explained in the Chinese geomancy in the latter part of this chapter.

The main reason for these representations of the forms is to highlight the symbolism. Many cultures around the world have incorporated nature and god through the use of symbolized forms and are represented directly or conceptually.

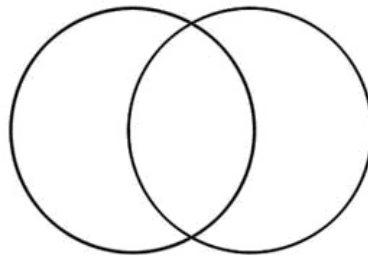


Figure 2. The Vesica Piscis comprises of two circles aligning each edge at the center of the circle. A form in the middle, is named the Vesica.

⁶ Nigel Pennick, *Sacred Geometry: Symbolism and Purpose in Religious Structures* (San Francisco : Harper & Row, 1980),17.

⁷ Nigel Pennick, *Sacred Geometry: Symbolism and Purpose in Religious Structures* (San Francisco : Harper & Row, 1980),18-19.

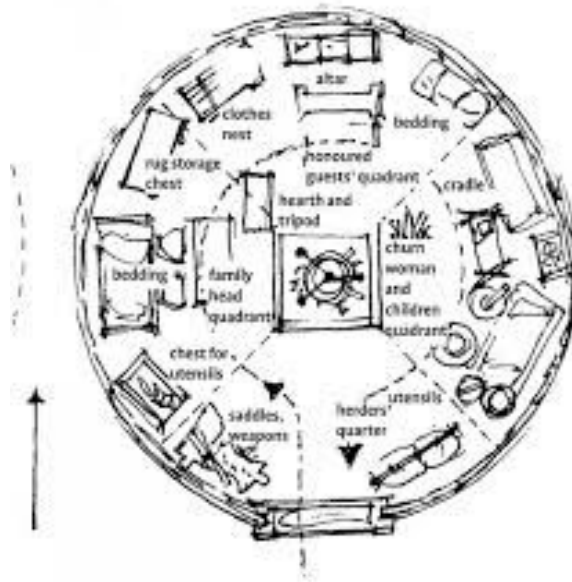


Figure 3 Typical Mongolian yurt. source: < http://www.solaripedia.com/13/318/3692/yurt_floor_plan.html>

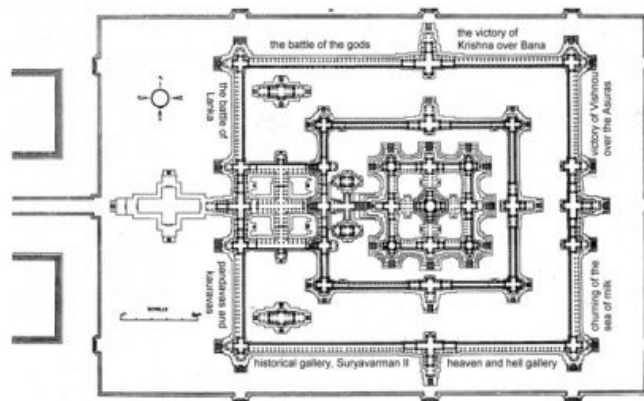


Figure 4 Plan view of Angkor Wat temple, Cambodia. source: < <http://www.sevuon.com/?q=node/95>>

1.2 Geometry

Practice of geometry involves the use of mathematical concepts and principles. The two most notable of these are the *Golden Ratio* and the *Angle*. The most well-known in the western societies is the *Golden Ratio*, also called the *Golden Mean* and visualized in the *Golden Rectangle* (Figure 5). The Golden Ratio is represented by the Greek letter Phi, ϕ , and is the recurring decimal 1.61803398875.... The ancient Greeks were the

pioneers of the Golden Ratio and it was evident in their early architecture, like the *Parthenon* (Figure 6). Many mathematicians and theorists have already analyzed the Parthenon and have concluded that it was well proportionate to the Golden Mean (Figure 7).

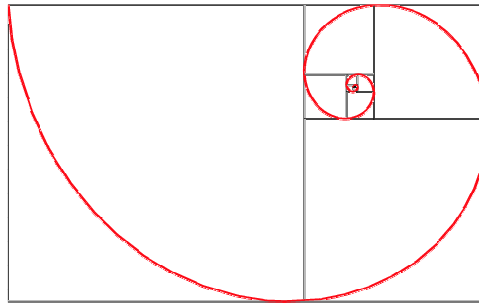


Figure 5: The *Golden Rectangle* .source: < <http://mathworld.wolfram.com/GoldenRectangle.html>>



Figure 6. source: <<http://sacredgeometryinternational.com/the-meaning-of-sacred-geometry>>

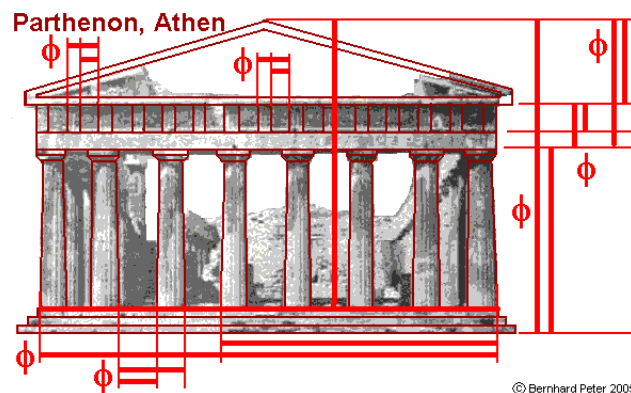


Figure 7. <<https://www.vismath.eu/en/topics/golden-ratio>>

1.2.1 Angle and Arithmetic

Angle is another form of geometric practice and is based on trigonometry and the relationship between two points.⁸ Ancient astronomers used trigonometry to designate movement and positioning of celestial bodies (Figure 8). As explained by Lawlor, "Angular positions of the sun, moon, planets and stars, were all related to the cyclic changes in the natural world, such as the moon phases, seasons, tides, plant growth, human and animal fertility, etc."⁹ Angles were in fact influenced by specific celestial patterns on earthly events. The ancients knew this and contemporary science coupled with modern equipment has verified that angular positioning of the moon and planets do affect the electromagnetic and cosmic radiation along with the influence of the earth which in turn, affects many biological processes.¹⁰ In ancient China, arithmetic was used to calculate the cosmos. The Chinese text of *Zhou bi*, or "The Gnomon of the Zhou(Dynasty)"¹¹, consisted of calculations that determine the dimensioning of the cosmos. Also explained in the *Zhou bi* is the circle being a model of the Chinese heavens. In part of the text of the *Zhou bi*, it explained "the 6 chi shadow cast by a vertical pole gnomon of 8 chi."¹² (figure 9 and 10) which is similar to the Western right triangle ratio of 3:4:5.¹³

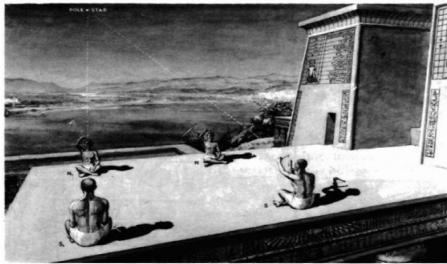


Figure 8. Ancients measuring celestial objects using angles and geometry (Lawlor, *Sacred Geometry*, 9)

⁸ Lawlor, *Sacred Geometry*, 9.

⁹ Lawlor, *Sacred Geometry*, 9.

¹⁰ Lawlor, *Sacred Geometry*, 9.

¹¹ Marja Sarvimaki, *Structure, Symbols And Meanings: Chinese and Korean Influence on Japanese Architecture*, (Doctorate of Technology diss., Helsinki University of Technology, 2003), pg. 189.

¹² Marja Sarvimaki, *Structure, Symbols And Meanings: Chinese and Korean Influence on Japanese Architecture*, (Doctorate of Technology diss., Helsinki University of Technology, 2003), pg. 189.

¹³ Marja Sarvimaki, *Structure, Symbols And Meanings: Chinese and Korean Influence on Japanese Architecture*, (Doctorate of Technology diss., Helsinki University of Technology, 2003), pg. 189.

The past civilizations observed very well the celestial objects. The patterns, shapes and the effect it had on people and other living creatures. Through these observations, they developed methods that pertains to mathematics, mainly angles and proportion. Through these calculations, one believes they have discovered god's proportion.

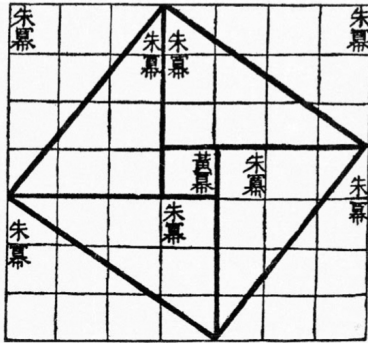


Figure 9. A Chinese diagram depicted by the *Zhou bi* text. source: < https://en.wiki2.org/wiki/Zhou_Bi_Suan_Jing >

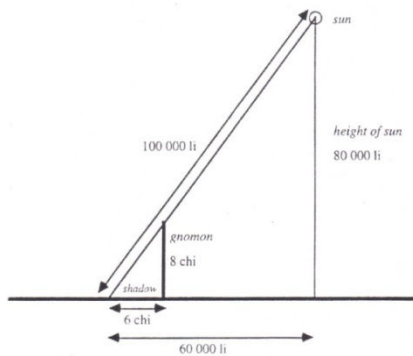


Figure 10. Arithmetic calculation of the cosmos as explained in the *Zhou bi*.¹⁴

1.3 Alignments

Many scientists, archaeologists and scholars have discovered that certain ancient archaeological sites have a strong relationship with the cosmic and celestial bodies. To describe these discoveries as it relates to the respective examples from selected sites means to look at key concepts in the form of alignments regarding Geomancy, Ley Lines and Astronomical Alignments.

¹⁴ Marja Sarvimaki, *Structure, Symbols And Meanings: Chinese and Korean Influence on Japanese Architecture*, (Doctorate of Technology diss., Helsinki University of Technology, 2003), pg. 190.

1.3.1 The Chinese Cosmology (*Feng Shui*)

There are many geomantic principles in the world, though only Geomancy will be discussed here. Geomancy, known commonly as Chinese *feng shui*, is a set of principles that have been practiced in China for many centuries. It is often used in practical applications on how and where to build cities, buildings and tombs. In his book, *An introduction to Feng Shui*, Bruun describes *feng shui* as an art of placement which is incorporated in architectural design, interior design, or decoration.¹⁵ Evelyn Lip

describes in her book, *Feng Shui in Chinese Architecture*, that *feng shui* is the "...art of placing, siting and orienting a building so that the building is in harmony with everything that surrounds it. It is also the art of finding balance in nature and harmony in the home and working environments. It addresses cultural and social issues of a particular society and makes reference to the natural, metaphysical and cosmological influences."¹⁶ It was believe that those who practice *Feng Shui* will experience an increase in the quality of life from being more positive and happy to having an improvement in one's career.

The Chinese believed that the earth has *qi*, or energy. The amount of *qi* on a site depends on the amount of undulating topography and physical condition and it was a good omen for those that dwelled upon it.¹⁷ In terms of situating a building on a site, in the northern part of China, it was always good to have the main facade facing south with the hills in the back, whilst having a lake in the front. It is believed that the hills provide protection from the north cold and filthy winds in the winter. Facing south allows the sun to warm the interior of the building.



Figure 11. The Forbidden City and its placement based on the *feng shui* principles. Google maps and author rendition.

¹⁵ Ole Bruun, *Introduction to Feng Shui* (New York: Cambridge University Press, 2008), 1-2.

¹⁶ Evelyn Lip, *Feng Shui in Chinese Architecture* (Singapore, Marshall Cavendish International, 2009), 75.

¹⁷ Lip, *Feng Shui in Chinese Architecture*, 76.

With the design elements referencing to *feng shui*, the entire palace within the Forbidden City (Figure 11) located in China, is oriented along a north to south axis, thereby achieving symmetry and balance. The facades of the Forbidden City are facing south towards the lakes. Flowing water and bodies of water in general is associated metaphorically with money.¹⁸ North of the Forbidden City are mountains and hills.¹⁹ There is a manmade hill made of coal that according to *feng shui* principle, protected the palace and its inhabitants.

1.3.1.1 The *luopan*, a geomancer compass

The *luopan* (figure 12) is an instrument that was used by a Chinese geomancer with his or her clients. With its design reminiscent of a western compass, the only difference is its association with divination and geomancy. On the circles of a *luopan*, there are all possible elements of Chinese Cosmology you can think of : The five phases, eight trigrams and the Chinese zodiac (the twelve animals: Tiger, Hare, Dragon, Snake, Horse, Rat, Ox, Monkey, Dog, Rooster, Pig and Sheep). Figure 13 shows a detail of the *luopan*. Here is an explanation of the geomancer compass by Magi Sarvimäki in her dissertation book, *Structures, Symbols and Meanings: Chinese and Korean Influence on Japanese Architecture*:

Indeed, it can be stated that if time was measured by the calendar and directed by the compass, the concordance between time and direction was measured by the *luopan*. For instance, as each individual was subject to twin influences, of the heaven, shown by astrology, and of the earth, revealed by *feng shui*, a geomancer usually took his client's date of birth (i.e. they year, the day and even the hour) into consideration, for this helped to identify precise directions and orientations which were to be the most favorable.²⁰

Feng shui allowed Chinese practioners to maintain balance through the auspicious placement of objects and architecture on a site. The

¹⁸ Marja Sarvimaki, *Structure, Symbols And Meanings: Chinese and Korean Influence on Japanese Architecture*, (Doctorate of Technology diss., Helsinki University of Technology, 2003), pg. 130.

¹⁹ Lip, *Feng Shui in Chinese Architecture*, 90.

²⁰ Marja Sarvimaki, *Structure, Symbols And Meanings: Chinese and Korean Influence on Japanese Architecture*, (Doctorate of Technology diss., Helsinki University of Technology, 2003), pg. 129.

geomancer compass is an instrument that illustrates a connection with the universal laws found in nature and time. With this instrument, one can orient their life's path to a favorable outcome allowing for potential spiritual growth.

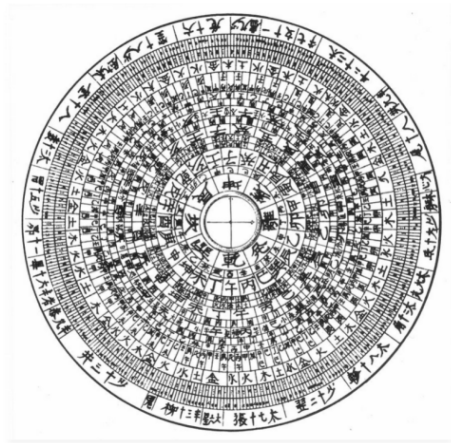


Figure 12. The *luopan*, geomancer's compass. source: < [http://fineartamerica.com/ featured/chinese-astrology-granger.html](http://fineartamerica.com/featured/chinese-astrology-granger.html)>

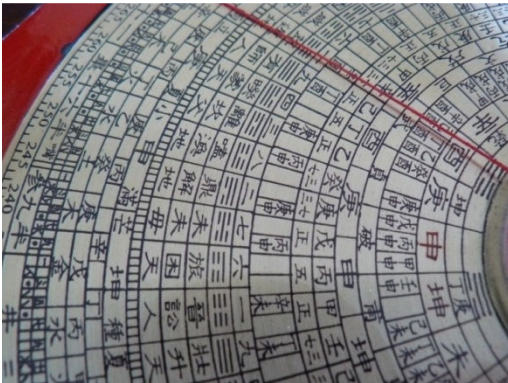


Figure 13. Close up of the *luopan*. source: < <http://imgkid.com/lo-pan-compass.shtml>>

1.3.2 Ley Lines:

Ley Lines are alignments that occur in a straight line connecting geographical locations or places of interest.²¹ The term was created by a businessman Alfred Watkins

²¹ Alex Whitaker. "Ley Lines". Ancient-Wisdom, 2012. Accessed April 14, 2015. <<http://www.ancient-wisdom.co.uk/leylines.htm>>

who came across the term Ley Line to describe the connection of ancient sites on a straight line or ancient tracks during his touring of the countryside in Herefordshire, England in 1921. Watkins also discovered that the Ley Lines orientations were related to the rising and setting of the sun.²² With his new found discovery, he published two books, *Early British Track ways* and *Old Straight Track*.



Figure 14. source: <<http://www.samosmanbooks.com/the-enigma-of-ley-lines/>>

In *Lines and Landscape*, by Nick Pennick and Paul Devereux, they investigated and concluded that the concept of Ley Lines were that they aligned toward burial-grounds.²³ Both Pennick and Devereux also discovered that certain pilgrimages, traditions and ceremonies were associated with straight lines. Their findings showed the reason behind these lines was the recognition of energies or presence of a magnetic field. Devereux then began research directed towards the effect radioactive and magnetic fields had on the human brain and how human beings and even animals can sense these magnetic fields.²⁴ It has been recognized that certain species' activity, like pigeon migration, is based on their ability to detect magnetism.²⁵ Paul Devereux's *The New Ley*

²² Clive Ruggles, *Ancient Astronomy: An Encyclopedia of Cosmology and Myth*, (2005), pg. 224-225.

²³ David Crowan, *Ley Line and Earth Energies*, (USA: Adventures Unlimited Press, 2003), pg. 3.

²⁴ Alex Whitaker. "Ley Lines". Ancient-Wisdom, 2012. Accessed April 14, 2015. <<http://www.ancient-wisdom.co.uk/leylines.htm>>

²⁵ Alex Whitaker. "Ley Lines". Ancient-Wisdom, 2012. Accessed April 14, 2015. <<http://www.ancient-wisdom.co.uk/leylines.htm>>

Hunter's Guide describes that straight roads were the paths for "faery and spirit".²⁶ Paul goes on to state in his argument that ancient cultures globally had a belief that spirits of the dead can only travel in a straight line.²⁷ Among many examples, this applies to Chinese geomantic beliefs.

Some Ley Lines have astronomical influences such as the Portuguese Ley Line (figure 15). Alex Whitaker explains the Portuguese Ley Line bases as follows:

Three of the most significant sites in Portugal are aligned in the direction of the spring full-moon, along an azimuth of 110°. The alignment starts near *Evora*, at the *Cromeleque dos Almendres*, one of Europe's oldest stone circles, which was constructed directly under the moons maximum southerly latitude (Stonehenge was built under the maximum northerly setting). Approximately 3 miles further along is the *Anta Grande do Zambujeiro* passage mound, the largest of its kind in all Iberia, and orientated along the same azimuth of 110°. This beautiful example of an astronomical (lunar) alignment terminates significantly at the original location of the *Cromeleque da Xarez*, a stone quadrangle.²⁸

²⁶ David Crowan, *Ley Line and Earth Energies*, (USA: Adventures Unlimited Press, 2003), pg. 3.

²⁷ Ibid, 3.

²⁸ Alex Whitaker. "Ley Lines". Ancient-Wisdom, 2012. Accessed April 14, 2015. <<http://www.ancient-wisdom.co.uk/leylines.htm>>



Figure 15. Ley Line of Portugal. source: <<http://www.ancient-wisdom.co.uk/leylines.htm>>

The importance of the discovery of Ley Lines would lead to many discoveries of sites as did with the Portuguese Ley Line and its observation of the lunar spring full moon. There is a lot to be learned about Ley Lines within the scientific and archaeological discipline as not much of it has been published in an academic standpoint, caused by possible criticism due to competition against academic publication and the professional scientific community depicting Ley Lines as an act of faith rather than using hard evidence.²⁹ But still more of the information has been published online and in journals. To this day, most of the public are intrigued by the idea of ancient structures aligning with other structures and a term called "Ley Hunting" has been a popular hobby amongst people.³⁰

As explained above, Ley Line is not particularly well known. Though, there is a correlation of the description of Ley Lines and how certain civilizations aligned and marked important celestial events through structural alignments. The diagram below is an example of a Ley Line.

²⁹ Clive Ruggles, *Ancient Astronomy: An Encyclopedia of Cosmology and Myth*, (2005), pg. 226.

³⁰ Clive Ruggles, *Ancient Astronomy: An Encyclopedia of Cosmology and Myth*, (2005), pg. 225.

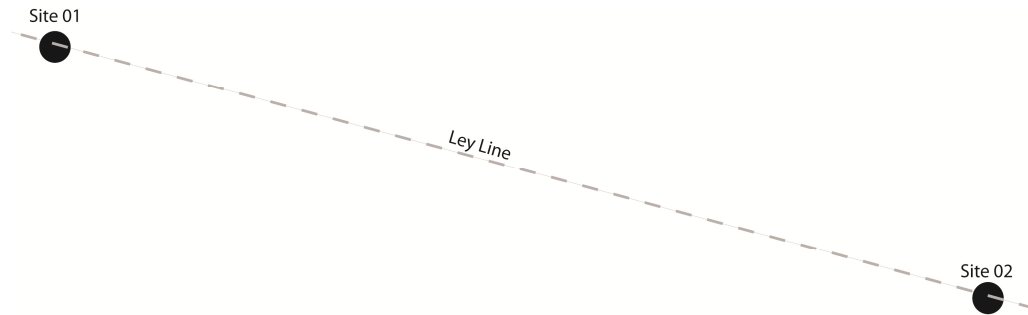


Figure 16. Ley Lines diagram between Site 01 and Site 02. Created by author.

1.3.3 Astronomical Alignments

Astronomical alignments can be best defined as architecture, or mega structures designed and oriented towards celestial bodies and celestial phenomena such as solar alignments. Alignments do not have to be strictly limited to mega structures or architecture, as layout of cities too, portray a relationship towards the celestial objects.³¹ Numerous ancient people designed their structures through lunar alignments, solar alignments, alignments of the solstice and equinoxes, and alignments of certain star constellations. There are many cultures throughout the globe that link their structures to the alignments to the astronomical bodies. In this part of the section, we examine structures that portray astronomical alignments with examples from the ancient civilization of England, Mexico, Ireland, Egypt and Asia.

1.3.3.1 Stonehenge

In England, probably the most sought-out mega structure is the Stonehenge in Wiltshire, England. Observing the Stonehenge, the structure itself is laid out in a concentric fashion. Many scholars have been theorizing the function of the structure questioning whether it was an ancient observatory for the sun, moon and other celestial phenomena, a structure for royal burial or a temple for certain rituals. No one knows the answer. But what is evident and intentionally designed by the ancient builders is its solstice alignments. Stonehenge is aligned towards the northeast during the *midsummer sunrise*, the sunrise of the summer solstice. During this time, the sun rises squarely

³¹ Ruggles, *Ancient Astronomy*, 8.

between the Heelstone (Figure 17) and possibly another stone (may have disappeared a long time ago). A beam of sun light would penetrate along the corridor of stones and would make its way towards the interior of the ring.³² In the opposite direction, Stonehenge would also align toward the sunset of the *shortest day*, or the winter solstice sunset.³³

In an online article, the author mentioned seven potential uses of the Stonehenge: sacred hunting ground, unity monument, astronomical calendar, an elite cemetery, giant bells, and a healing site.³⁴ Even though these set of reasons are theories, they probably apply to other structures throughout the globe. What is known from the Stonehenge is its successful nature as a civic space and structure that has significant astronomical alignment. With its structure erected in the middle of nowhere, it was likely an attraction for ancient civilizations. Today, the Stonehenge is a major tourist attraction and a heritage site for the natives.



Figure 17. The Heelstone in the background. source: <<http://earthsky.org/human-world/gallery-the-summer-solstice-as-seen-from-stonehenge>>

³² Ruggles, *Ancient Astronomy*, 407.

³³ Ruggles, *Ancient Astronomy*, 407.

³⁴ Tia Ghose. "Stonehenge: 7 Reasons the Mysterious Monument was Built," Last modified March 21, 2014. <<http://www.livescience.com/44283-why-stonehenge-was-built-theories.html>>



Figure 18. Winter solstice alignment. source: <http://community.novacaster.com/showarticle.pl?id=11160;n=4001>

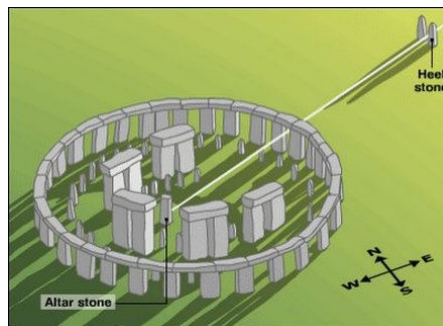


Figure 19. source: <http://historyofarchitecture.weebly.com/prehistoric.html>

1.3.3.2 Uxmal

In Mexico, probably the two most popular sites that pertain to astronomical alignments are located in the ancient cities of Uxmal and Uaxactun. Uxmal is a Mayan city situated upon the hills of northern Yucatan. The layout of the city (Figure 20) is grid-like and according to many scientists, the buildings are deliberately oriented towards the celestial bodies, most importantly towards the planet Venus. For example, on the front wall of the Governor's Palace at Uxmal (Figure 22), there are numerous Mayan writings that suggest its connection with Venus. Modern scientists also found out the site was an observatory for the rising and setting of the sun and it also functioned in

monitoring the moon.³⁵ Likewise, the main entrance of the Governor's Palace is aligned with Venus during its southerly most rise.³⁶ Interestingly, alignments toward Venus influenced the layout of the city itself.³⁷

The question arises to why the Mayans did this and what was its significance towards the inhabitants of the city itself. The site of Uxmal is composed of flat dry grass land area and forest surrounding the city displaying that water was scarce. Fascinatingly, the Mayans built massive water cisterns that captured the rain water. Could it be that the layout and design of the ancient city correlate with the season of rain?

In a video documentary, historians believed the Mayans primarily did sacrificial rituals among the cities. There is visual evidence explained clearly on the ancient Mayan murals, founded in 1946 in Yaxchilan, Mexico, depicting sacrificial ceremonies. The Mayans saw the planet Venus as a harbinger for war.³⁸ They were in fact very observant of the stars. Their lives were planned around them. Their most important star is Venus because like was mentioned earlier it was a precursor to battles and war. The Mayans arranged their battles to coincide with the proper alignment of Venus. Captured enemies would also be sacrificed via the position of Venus.³⁹

This gives explanation to why the Governor's Palace was aligned with Venus. What specifically does Venus have to do with war and the Governor's Palace? Does it have to do anything with Royal power and status?

³⁵ Ruggles, *Ancient Astronomy*, 405-408.

³⁶ Samuel L. Macey, *Encyclopedia of Time*, (New York, Routledge: 1994), pg.

³⁷ Ibid, pg. 30.

³⁸ "Who Killed the Maya? (Full Documentary)," YouTube video, 50:10, posted by "Free Documentary," May 26, 2014. <https://www.youtube.com/watch?v=SQU56gqyQyU>

³⁹ Minster, Chirstopher. "Ancient Maya Astronomy". Accessed April 30, 2015. <http://latinamericanhistory.about.com/od/ancientlatinamerica/p/Ancient-Maya-Astronomy.htm>

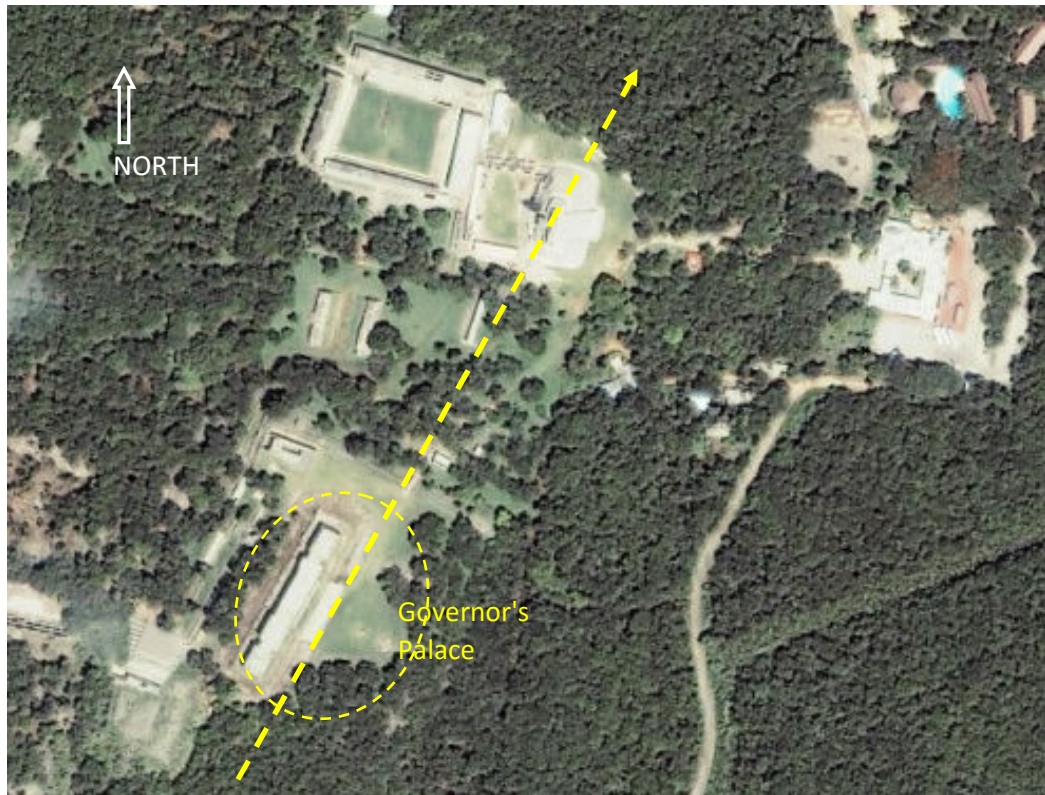


Figure 20. Satellite imagery of Uxmal arrow aligned with Venus. source: http://d32010uxmal.blogspot.com/2010_10_01_archive.html

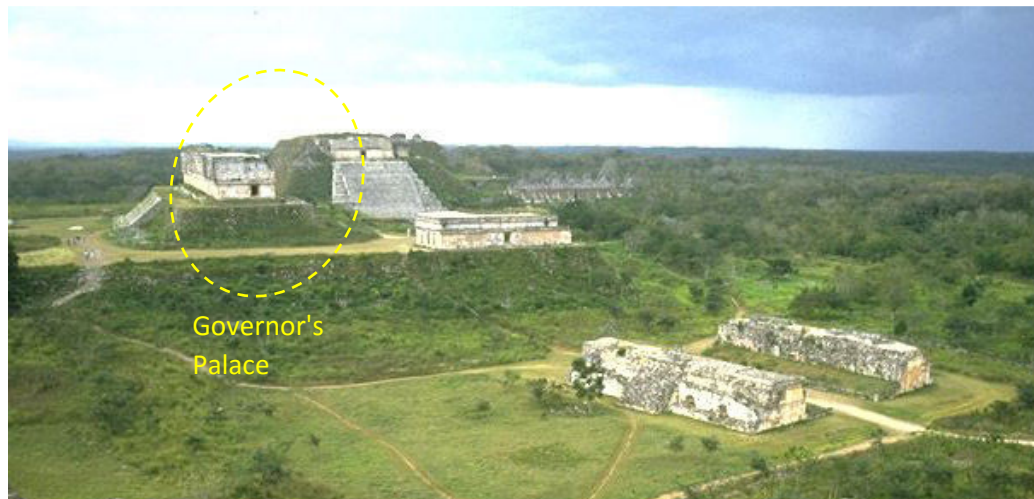


Figure 21. The Governor's Palace at the background. source: <http://www.planetquest.org/learn/dresden.html>



Figure 22. The Governor's Palace. source: <<http://commons.wikimedia.org/wiki/File:Uxmal-Palace-of-the-Governor.jpg>>

1.3.3.3 Uaxactun

Another important Mayan site that sits about 200 miles south of Uxmal is Uaxactun. It is there that an ancient architectural complex exists that provides some evidence of astronomical alignments, mainly the solstices and equinoxes. These groups are called *Group E Structures* and are located on both the eastern and western side of the plaza, which is located east of the center of the city. North of the city sits another set of structures, but not much can be said about its significance towards celestial alignments. On the West of the city sits a fourteen meter tall pyramid, named *Structure E-VII*. North to south of the city are three buildings evenly spaced and when a person views the three structures (called *E-I*, *E-II*, and *E-III*) from *Structure E-VII*, all three buildings align

strategically towards the summer solstice, equinoxes and the winter solstice. The ancient city of Uaxactun was the first renowned site to be called a "solar observatory".⁴⁰

The Mayans built these structures for astronomical purposes and used it as a calendar to note the longest day of the year (Summer Solstice) and the shortest day of the year (Winter Solstice) and the equinoxes (Days of equal lengths). It appears they had used these structures to pinpoint the seasons for planting and harvesting corn, the Mayan's staple food.



Figure 23. Structure E-VII surrounded by overgrowth. source: <http://www.latinamericanstudies.org/uaxactun.htm>



Figure 24. Structure E-1,E-2,and E-3 source: <http://chichcalan.com/vrml/E123.htm>

⁴⁰ Ruggles, *Ancient Astronomy*, 170-171.

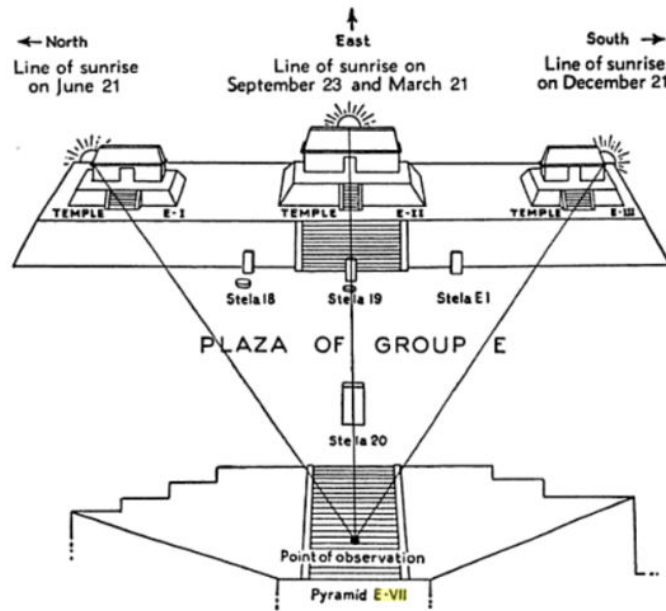


Figure 25. Astronomical Alignments towards the solstice and equinoxes. source: <misfitsandheroes.wordpress.com>

1.3.3.4 Newgrange

The structures that were previously described function both as a calendar and an observatory for celestial bodies. Such structures could also function as burial grounds that align toward the rising or setting of the sun. One great example is Newgrange, an Irish passage tomb located in Ireland. Newgrange is built as a mound measuring about 80 meters in diameter with stones placed at the base functioning as a decorative feature.

Newgrange is located in the Boyne River Valley, northeast of Dublin, Ireland. It was estimated that it was built around 3150 B.C. by skilled farmers and astronomers

within the area at the time. The monument is called a passage tomb because of its long passage way culminating in a center chamber where sits three other smaller chambers at right angles to each other.⁴¹ Bone remains and stone basins were found at these mini chambers. There is a "roof-box" device, located above the entrance that opens towards the rising of the winter solstice, where during that time of day, a ray of sun light illuminates the central chamber.⁴²

A theory from a documentary states Newgrange being a tomb could be because the inhabitants of the area believed in life after death. During the winter solstice, which marked the beginning of the new year, a ray of the sun would light up the interior of the inner chamber taking with it the souls of those buried in the chamber.⁴³

The form and functionality aspect of the structure makes sense. For example, the mound and the inner chamber is a representation of the female womb during pregnancy. The sun ray symbolizes the male giving life as it penetrates the inner chamber. Interestingly, the shape of the inside of the mound is reminiscent of the star constellation Cygnus.⁴⁴ Could it be that the ancient society of Newgrange built these structures to remind oneself to be good in life and if followed the path of positive endeavors, one shall be rewarded an afterlife with the stars?

⁴¹ "History Channel," YouTube video, 5:02, Posted by "Mythicalireland", May 10, 2014, <https://www.youtube.com/watch?v=Krom4Pql-j0>

⁴² Ruggles, *Ancient Astronomy*, 310.

⁴³ "History Channel," YouTube video, 5:02, Posted by "Mythicalireland", May 10, 2014, <https://www.youtube.com/watch?v=Krom4Pql-j0>

⁴⁴ "History Channel," YouTube video, 5:02, Posted by "Mythicalireland", May 10, 2014, <https://www.youtube.com/watch?v=Krom4Pql-j0>



Figure 26. Newgrange aerial shot. <<http://www.socialsoccer.ie/index.php/things-to-do-dublin/33-newgrange-5000-years-old>>

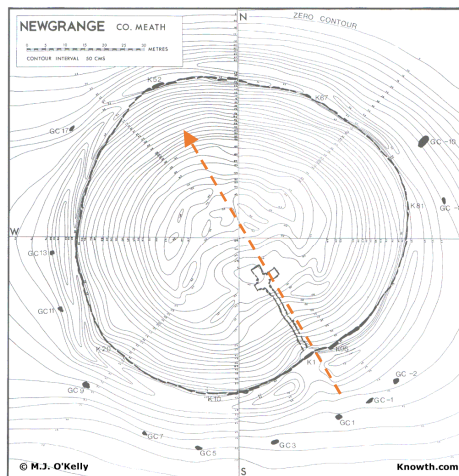


Figure 27. Plan of Newgrange. Arrow depicts Winter solstice sunrise. source: <<http://www.newgrange.com/newgrange-plans.htm>>

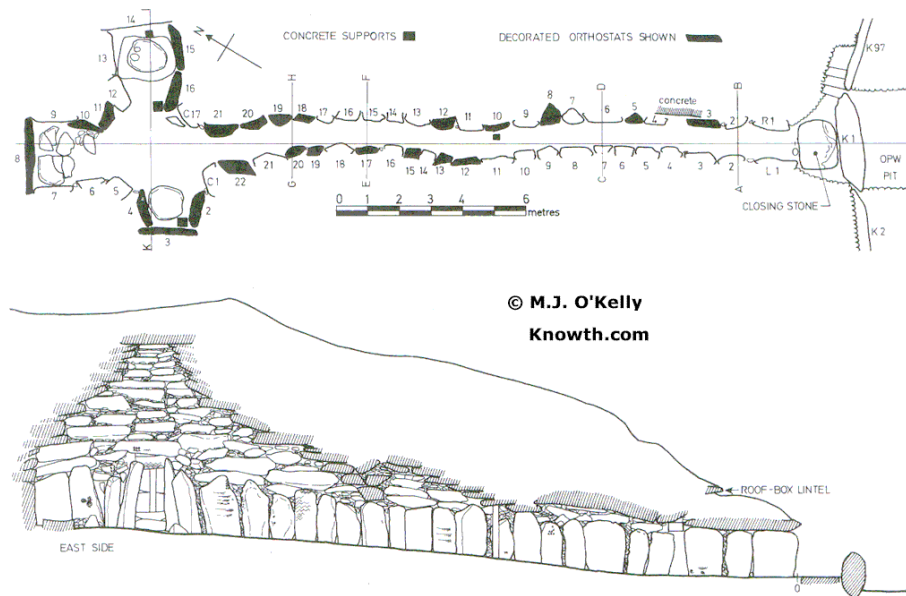


Figure 28. Newgrange section. source: <<http://www.newgrange.com/newgrange-plans.htm>>

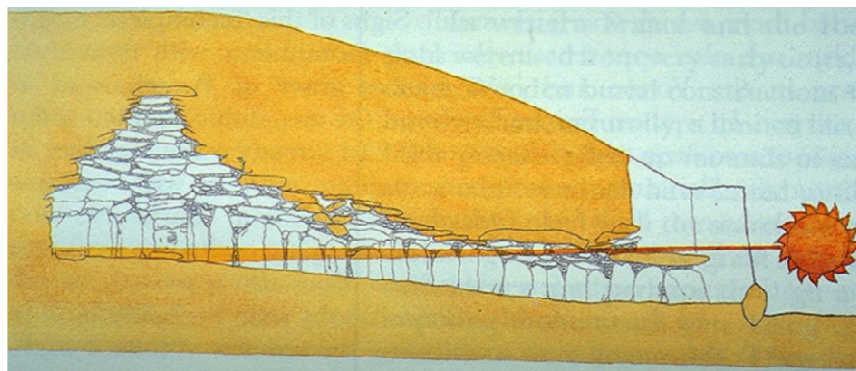


Figure 29. Winter solstice illuminating the inner chamber. source:
<<https://www.studyblue.com/notes/note/n/arc-2111-study-guide-2012-13-hollengreen/deck/9726268>>

1.3.3.5 Precinct at Amen-Re

Like the natives of Ireland, the Egyptians were also keen of the afterlife. Within the Precinct of Amen-Re (also called Amon-Ra), there are many tombs with paintings on the ceilings depicting star constellations, stars, and planets. The Egyptians had a strong belief of the afterlife within the night sky. They refer to this as *Duat* or the otherworld. The center of the Precinct is the location of the great temple of Amen-Re, in which its axis aligns with the Winter Solstice Sunrise. The reason for its orientation was that the inhabitants of the precinct were sun cults, for the deity Ra (Re), is associated with the sun.⁴⁵ It may have also been that the Egyptians used the observation of this solstice event as a marker of the new year, where spring and abundance of rain will come forth.

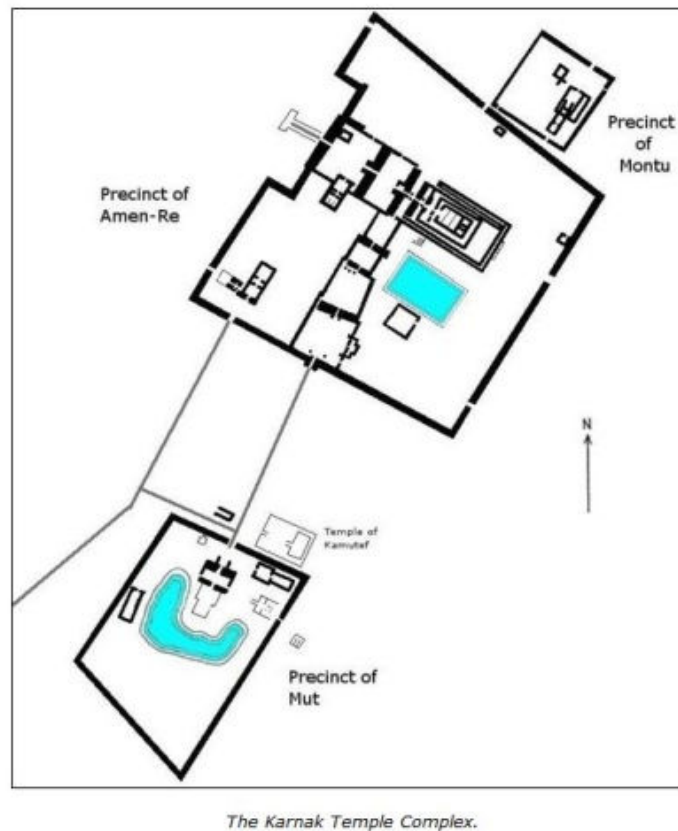


Figure 30. The Precinct of Amen-Re layout. source: < <http://www.ancient-wisdom.co.uk/egyptkarnak.htm>>

⁴⁵ Clive Ruggles, *Ancient Astronomy: An Encyclopedia of Cosmology and Myth*, (2005), pg. 144-145.

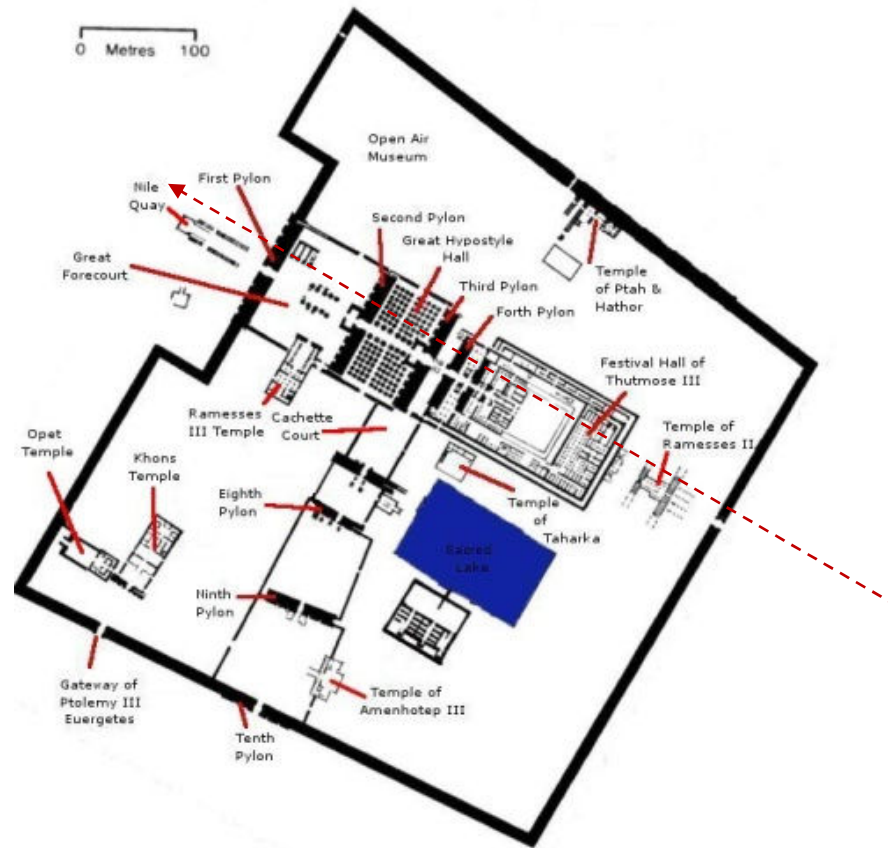


Figure 31. Detailed Layout of the Precinct of Amen-Re. Arrow depicts alignments source: http://en.wikipedia.org/wiki/Precinct_of_Amun-Re



Figure 32. View from the interior of the Amen-Re complex during Winter Solstice. source: <http://www.civicegypt.org/?p=53041>

1.3.3.6 Chaco Canyon

Chaco Canyon is Mexico's designated World Heritage Site which was inhabited by the ancient Pueblo Indians. This ancient landscape has many archaeological sites that suggest astronomical alignments towards the rising and setting of the sun during its solstices and equinoxes and of the positioning of the moon during its lunar stand stills.⁴⁶ One of the larger sites is the Pueblo Bonito.

Pueblo Bonito is a massive walled city-like great house with stone walls as high as five stories and is oriented with the cardinal directions. It has been estimated that 4.5 acres were built in the area consisting of seven hundred rooms and *kivas*, or underground rooms for ceremonial purposes, oriented in a semi-circle fashion around a central plaza.⁴⁷ Being that the area was dry, water cisterns may have been built within the great house.

Just below Pueblo Bonito is a larger *kiva* named Casa Rinconada. This larger *kiva* is the only one to be isolated within Chaco Canyon. The structure consists of a circle divided into four equal parts with openings north to south and north east. There are also niches that are within the walls of the Casa Rinconada, which may suggest the whole structure could be a calendar. Approximately ten weeks before the summer solstice, the rising sun ray will hit niche number 25 as seen in figure 30. During the summer solstice, the rising sun touches niche E.⁴⁸

In a cultural perspective, this is important because it displays a continuity of the practices of the ancient Indians to modern day Indian world view of cosmology, perceiving the concept of symmetrical division of the world upon a central axis. This is evident among many indigenous Native Americans cultures today. Perhaps Chaco Canyon was the birthing place of the many Native American Indian tribes that we see today.

⁴⁶ Clive Ruggles, *Ancient Astronomy: An Encyclopedia of Cosmology and Myth*, (2005), pg. 80-81.

⁴⁷ Clive Ruggles, *Ancient Astronomy: An Encyclopedia of Cosmology and Myth*, (2005), pg. 80-81.

⁴⁸ Ronald E. Mickle, *Archeoastronomy of the Chacoan Pueblo*, (Denver, Colorado: Ronald E. Mickle, 2005), pg. 6-7.



Figure 33. Satellite view of Chaco Canyon with notable archaeological sites. source:
<http://www.uintahbasintah.org/utah3dmapspage.htm>



Figure 34. Zoomed in of Satellite view with Pueblo Bonito at the center and Casa Rinconada at bottom. source:
<http://www.uintahbasintah.org/utah3dmapspage.htm>

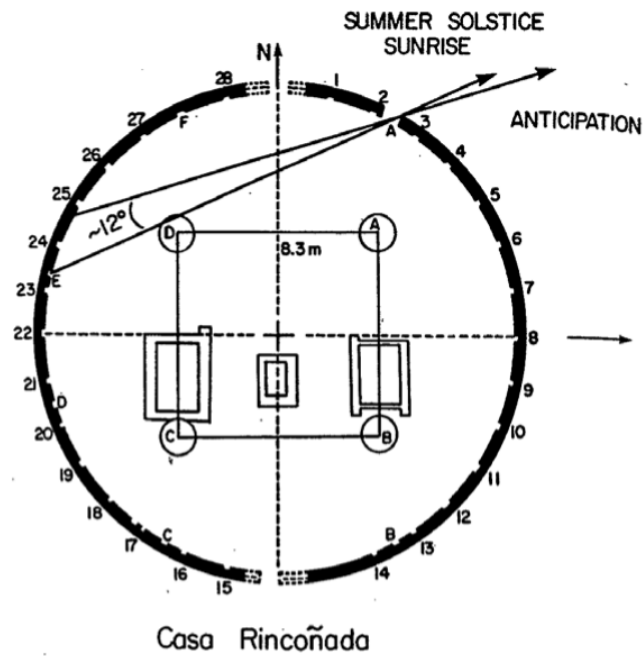


Figure 35. Casa Rinconada plan view .source:
<http://www.denverastrosociety.org/dfiles/mickle/ArcheoastroChacoanPueblo.pdf> > pg. 7.

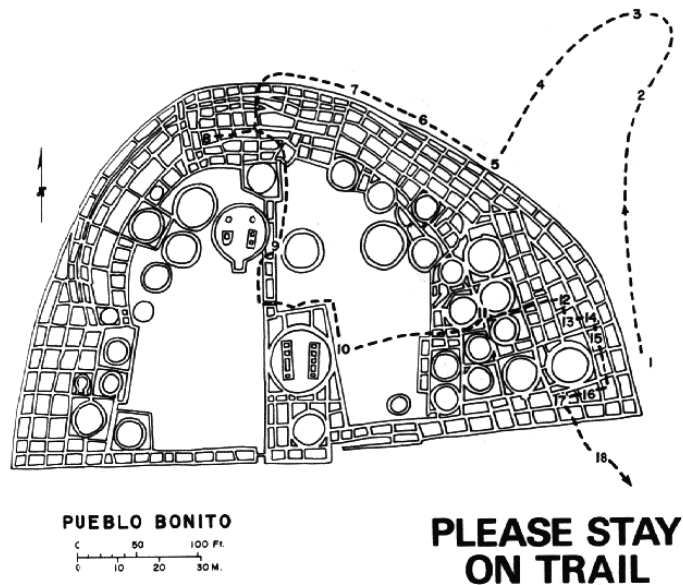


Figure 36. A plan view of Pueblo Bonito. source: < <http://www.ratical.org/southwest/PBsiteGuide90.html>>

1.3.3.7 Angkor Wat

In the Cambodian city of *Angkor*, meaning Holy City, there sits a temple complex that was built and dedicated to the Hindu god Vishnu. The inhabitants of this area were the ancient Khmer civilization, who underwent a series of transformations, shifting religions from Buddhism and Hinduism, to the influence of European dominance. There are numerous temples on site such as the Angkor Thom and the temple of Phnom Bakhen, but the most important and significant temple in the area is Angkor Wat.⁴⁹

Angkor Wat has many elements to its design in terms of cosmology and astronomical alignments. The central tower of Angkor Wat provides the Buddhist and Hinduism concept of axis mundi, meaning at the center of the four cardinal points is the cosmic axis where the connection of heaven and earth occurs.⁵⁰ There is the concept of *mandala*, also a Hindu and Buddhist symbol, representing a square with four gates symbolizing the earth and a circle at the central point which symbolize the heavens.⁵¹

In terms of astronomical alignments, the entrance of Angkor Wat is oriented west and expresses a link between the setting of the sun and death. Since the structure was of Hinduism origin, orienting to the west could have been associated with the deity Vishnu.⁵²

There have been many other theories from archaeologist and scholars depicting Angkor Wat to be aligned with the star constellation Draco.⁵³ But less is known whether the ancients intentionally incorporated it within the design. Whatever the case may be culturally, Angkor Wat stands as being the largest temple ever built and the natives of this area are very proud to have this magnificent structure still intact today.

⁴⁹ Clive Ruggles, *Ancient Astronomy: An Encyclopedia of Cosmology and Myth*, (2005), pg. 14.

⁵⁰ Donald K. Swearer, *The Buddhist World of Southeast Asia* (2nd Edition), (USA: State University of New York Press, 2010), pg. 91.

⁵¹ Marja Sarvimaki, *Structure, Symbols And Meanings: Chinese and Korean Influence on Japanese Architecture*, (Doctorate of Technology diss., Helsinki University of Technology, 2003), pg. 109.

⁵² Clive Ruggles, *Ancient Astronomy*, pg. 14-15.

⁵³ Clive Ruggles, *Ancient Astronomy*, pg. 14-15.

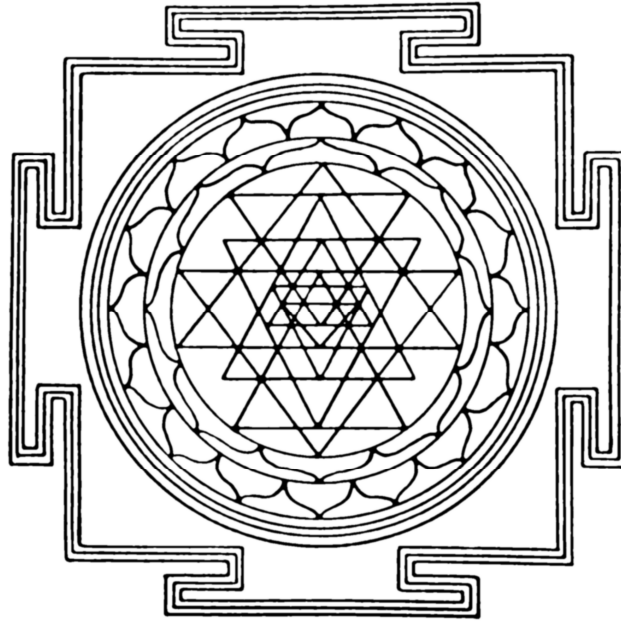


Figure 37. Mandala Symbol. source: <<http://en.wikipedia.org/wiki/Mandala>>

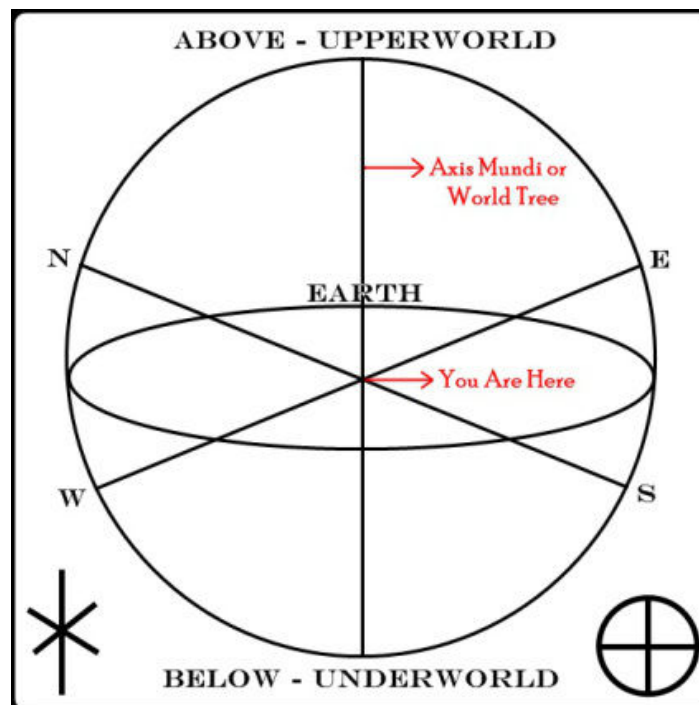


Figure 38. Axis Mundi diagram. source: <<http://numerocinqmagazine.com/2014/08/08/high-culture-poetic-imagination-and-the-submerged-center-essay-paul-pines/>>



Figure 39. Angkor Wat. source: <<http://www.picswallpaper.com/download/aerial-view-of-angkor-wat-wallpaper/>>

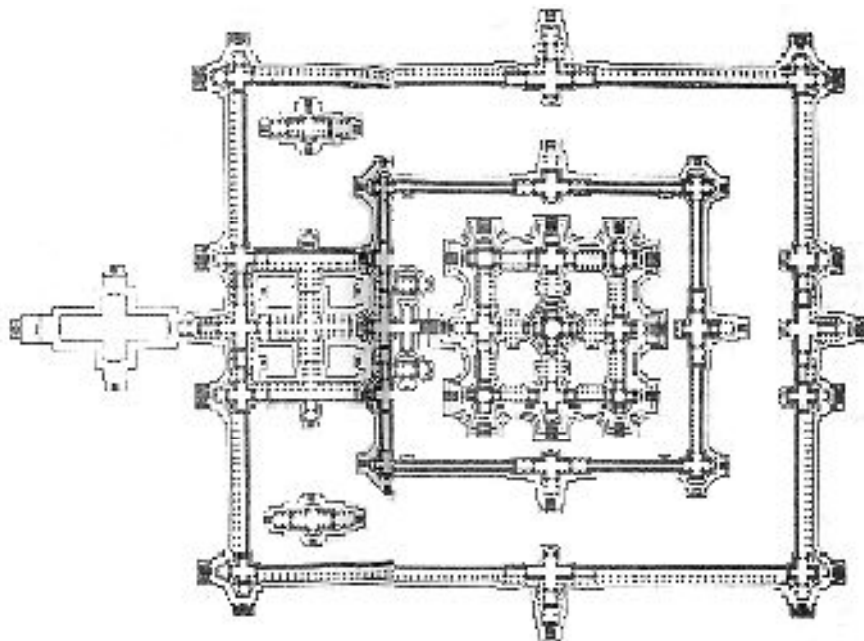


Figure 40. The plan of Angkor Wat depicting orientation towards the cardinal points where the entrance points west. source: <<http://dcsymbols.com/mastersquare/page4.htm>>

1.3.3.8 Pyramids of Giza

There are over seventy pyramids in Egypt. Of those seventy, there are three that were the most popular in terms of alignments. They were called the Pyramids of Giza, built by three pharaohs between the twenty-seventh to the twenty-fifth century B.C.E.⁵⁴ These Pyramids were carefully aligned with the cardinal direction on a north to south and east to west direction. One of the pyramids named *Khufu* has a unique design. According to Clive Ruggles, the author of *Ancient Astronomy: An Encyclopedia of Cosmology and Myth*, the sides of the pyramids were aligned precisely to one tenth of a degree which is equal to one fifth of the diameter of the sun. The reason why, as Ruggles states, is the fact that the Old Kingdom of Egyptian practice maintained the order of the cosmos.

There was a strong notion that the northern star, was the resting place for immortals. On the western face of the Pyramid, was the setting of the sun, the Egyptians called this the *Duat*, meaning the entrance to the other world. Within the *Khufu* pyramid, specifically in the King's tomb, there are inner chambers that suggest alignments towards the celestial sky. In the 1960s, scientists discovered that indeed some of these inner chambers were aligned with the star constellation Thuban and Orion's belt at the time of the construction of the pyramid. Could it be that these chambers served as the entrance point or passage way to the afterlife? It was quite obvious within the *pyramid texts*, found in the pyramids dated back to the Old Kingdom and mentioned that a pharaoh had to visit the stars in the afterlife.

Another famous theory that developed in the 1990s, by Robert Dauval, speculated that the plan and layout of the Giza Pyramid was in direct alignment with the star constellation Orion's belt. Dauval along with other theorist, Graham Hancock, described this theory as a "sky map". They go on to say that the Giza pyramids were part of the mapping of the milky way and other stars within the sky.⁵⁵

⁵⁴ Clive Ruggles, *Ancient Astronomy: An Encyclopedia of Cosmology and Myth*, (2005), pg. 353.

⁵⁵ Clive Ruggles, *Ancient Astronomy: An Encyclopedia of Cosmology and Myth*, (2005), pg. 355.

Although these may be theories, the pharaohs believed in the afterlife and the strongest evidence lies in the pyramids themselves, with paintings and scriptures representing spells to ensure the deceased had a safe passage during their trip into the other world.⁵⁶



Figure 41. Site context of the Giza Pyramid with the city of Cairo. source: <<http://albertzurita.eu/pyramids-from-space/>>

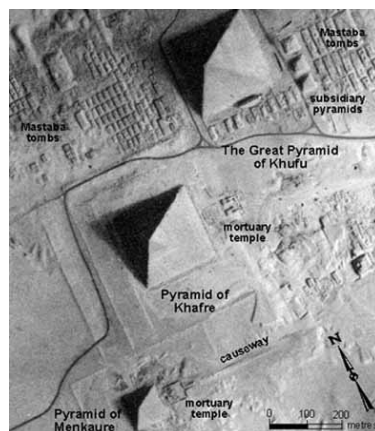


Figure 42. Layout of the three Pyramids with *Khufu* being the bigger of the two. source: <<http://www.crystalinks.com/greatpyramid.html>>

⁵⁶ Clive Ruggles, *Ancient Astronomy: An Encyclopedia of Cosmology and Myth*, (2005), pg. 145.

Reflection

On a global scale, many civilizations designed their architecture based on sacred geometry, specifically the order and proportion of the universe as represented in forms and shapes found in nature. From these observations, societies developed angles and geometry that turned into mathematical equations that are still being used today.

Other ancients used the site and the celestial sky to place objects and architecture. The Chinese practiced feng shui by placing architecture at auspicious locations based on the principles of the theory. Certain sites located at a long distance, were aligned on a straight line, or ley lines. Some of these sites that were on the ley lines were markers of key celestial events.

Calendars and season markers were the motivating factor for most civilizations that aligned their structure towards the winter and summer solstice. Some aligned their structures towards the appearance of planetary objects such as Venus, which functioned as insight of war. Furthermore, other structures functioned as tombs that prepared the dying for the afterlife.

It is important to understand that the ancients relied on the stars, sun, and moon to guide them; there was purpose in doing so. Chapter one focused on civilizations on a global scale briefly noting alignments based on keen observation of the universal sky and the environment around them. The next Chapter elucidates alignments and the function of spaces specifically in the Pacific.

Chapter 2 Pacific spaces and alignments

In the previous chapter, ancient civilizations reference part of their lives with the cosmos, thus orienting their structures and community towards the universe. Within the Pacific region, cultures placed importance on the stars, moon and sun, but with a rather different purpose of marking the celestial sky for voyaging. This led the Pacific navigators to build markers; *marae* or temples; and *ahu*, or altars, to emphasize a sacred site. This chapter discusses the types of spaces that are prevalent in the Pacific region. The value of the research in this chapter also brings to light the importance of alignments in the evolution of a culture.

2.1 Site placement and Solar Alignments

Some cultures throughout the Pacific would mark important celestial bodies noting its importance to navigation. Others built structures for religious importance. A few marked the sun's solstices for marking the seasons. The importance of aligning a marker interprets that the ancients were observant of the sky and surrounding environment. This section focuses on the idea of the placement of structures by observation of celestial alignments in correlation to the surrounding landscape. Like many ancient civilization, this practice validated the importance of a place.

NOTE: In the southern hemisphere, June 21st is considered the winter solstice, the shortest day. The summer solstice occurs on December 21 and is the longest day.

2.1.1 Arorae

In the vicinity of the southern half of the Gilbert Islands, sits Arorae, an atoll. On the northern tip of the island is a famous site called the "Arorae Navigational Stones"; the inhabitants have called this place *Te Atibu-ni-Borau*, "stones for voyages".⁵⁷ Although

⁵⁷ Brett Hilder, "Primitive Navigation in the Pacific-2" *The Journal of the Polynesian Society*, Vol. 71, No. 34 (1962): pg 80-97, accessed May 31, 2015, <http://www.jps.auckland.ac.nz/document?wid=3204&page=0&action=searchresult&tar_get=#>, pg. 84.

the name suggests navigational purposes, there are no stories or myths suggesting the real purpose of those stones. It was not until 1957, that captain Brett Hilder examined the orientation of these stones and found that seven of the nine stones were aligned precisely towards inhabited islands to the north west of Arorae, ranging over a distance of fifty miles. The theories that he presented were that these stones could have been a marker for voyagers embarking towards the sea, aiming their destination to the islands. Another theory that could have been highly probable according to Hilder, is its use as a navigational school marking and aligning certain stars for the students to memorize before going the sea.

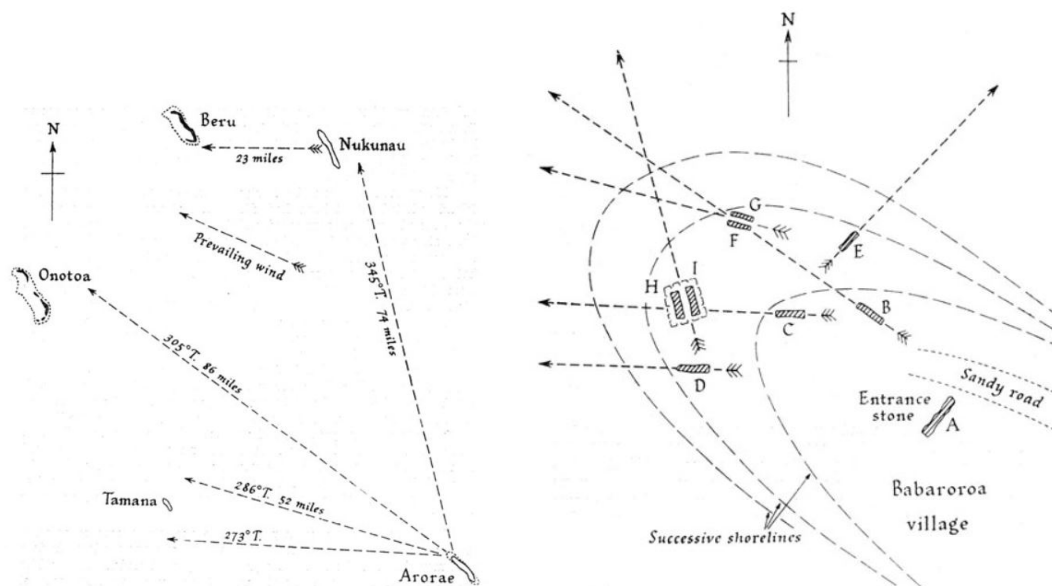


Figure 43. (left) Alignments towards the islands. (right) Arorae northern coast depicting orientation of stones towards a direction. source: Brett Hilder, "Primitive Navigation in the Pacific-2," pg. 87 and 85.



Figure 44. Arorae Navigational Stones. source: <<http://www.janeresture.com/arorae/>>

The inhabitants of Arorae were living on an island that was destined to have its resources depleted. With the possible situation of lacking resources, the only means of survival was navigating towards new found land. The people then used markers to align the stars that located the islands and helped the navigators to navigate. Below is a diagram of the orientation of stones towards key sites, to which an important resource is located.

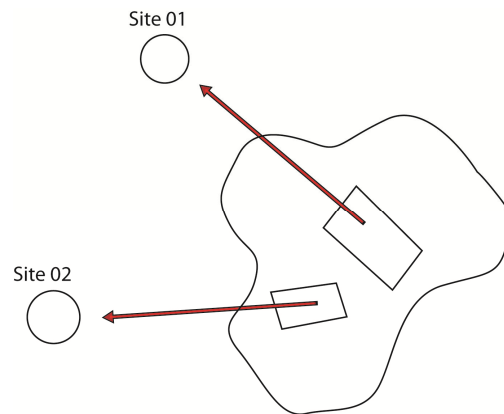


Figure 45. Alignment diagram of objects orienting towards key sites. Created by author.

2.1.2 Nan Madol

Located in Pohnpei, an island in the Federated States of Micronesia, Nan Madol is an ancient city consisting of large outcrops of artificial inlets. Most of these inlets are surrounded by walls made of volcanic rock and boulders south east of the island of Pohnpei and functioned as a barrier against waves. Like other ancient monuments around the world that oriented their structures towards the rising and setting of the sun and stars, archaeologists began to theorize that Nan Madol itself may have the same purpose. In 2006, archaeologists did field work and discovered alignments at Nan Douwas, a tomb like feature within Nan Madol. The central tomb sides along with the walls are oriented with the cardinal points.⁵⁸ Another finding was the correlation between Nan Douwas and

⁵⁸ Esteban, César, "Orientations and Astronomy in Prehistoric Monumental Tombs of Nan Madol (Pohnpei, Micronesia)," *Esteban: Studies in Global Archeology no. 20*: pg. 167-190, Spain. Accessed May 20, 2015, <https://www.academia.edu/9801221/Orientations_and_Astronomy_in_Prehistoric_Monumental_Tombs_of_Nan_Madol_Pohnpei_Micronesia_>, pg. 172.

the rising of stars. In traditional Micronesian navigation, the stars of Orion's Belt, Pleiades and the Southern Cross were important to voyagers. At Nan Douwas with the view towards the vast ocean, one can see the solstice, equinoxes and the rising of the three important stars in relation to the sacred island in the front, named Pweliko.⁵⁹ On an interesting note, most of the structures in Nan Madol are aligned northwest to southeast, indicating a possible alignment to the rising of the Southern Cross.⁶⁰

These structures were not arbitrarily placed. According to Micronesian creation mythology, the original builders *Ohlosihpa* and *Ohlosohpa*, toured the whole island for a proper place for Nan Madol and later chose the most eastern tip of the island. This indicates that the site had significance for the function of the complex.⁶¹

The complex of Nan Madol functions as a civic space that is confined by walls for protection. The openings within the walls function as both an entrance and exit to and from the sea and were aligned to the Southern Cross. Mythological stories explained that the chosen site for Nan Madol was based on careful planning, giving advantage to the observation of the celestial sky.

⁵⁹ Esteban, César, "Orientations and Astronomy in Prehistoric Monumental Tombs of Nan Madol (Pohnpei, Micronesia)," pg. 176-177.

⁶⁰ Esteban, César, "Orientations and Astronomy in Prehistoric Monumental Tombs of Nan Madol (Pohnpei, Micronesia)," pg. 186.

⁶¹ Esteban, César, "Orientations and Astronomy in Prehistoric Monumental Tombs of Nan Madol (Pohnpei, Micronesia)," pg. 179.



Figure 46.(Left) Outer wall and entrance of Nan Madol.(Center) Ariel view of Nan Madol. source: http://www.janeresture.com/oceania_arch/index.htm. (Right) Ariel view of Nan Douwas from Morgan's *Prehistoric Architecture in Micronesia*, pg. 64.

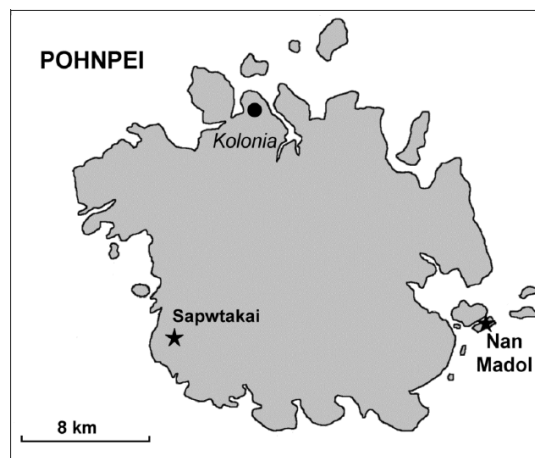


Figure 47. Map of Pohnpei. Image from Esteban's "Orientations and Astronomy..." pg. 168.

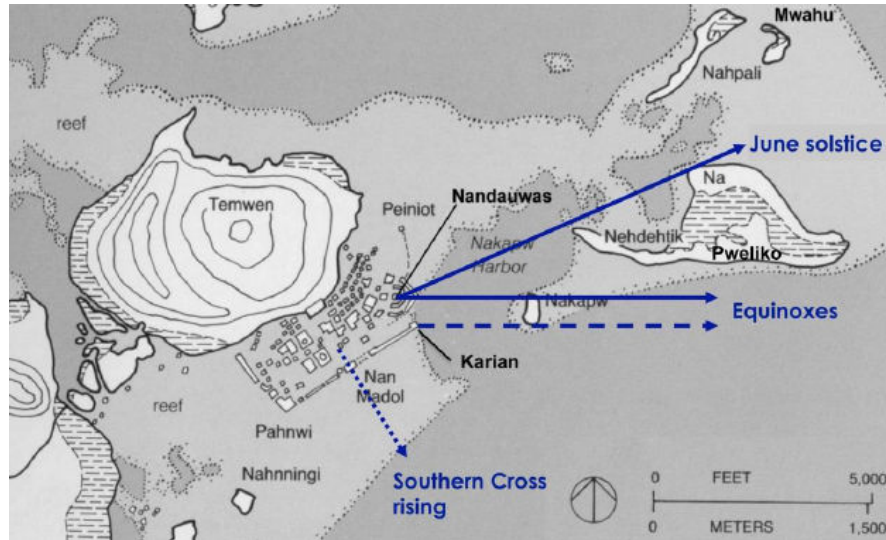


Figure 48. Map of Nan Madol. Image from Esteban's "Orientations and Astronomy..." pg. 169.

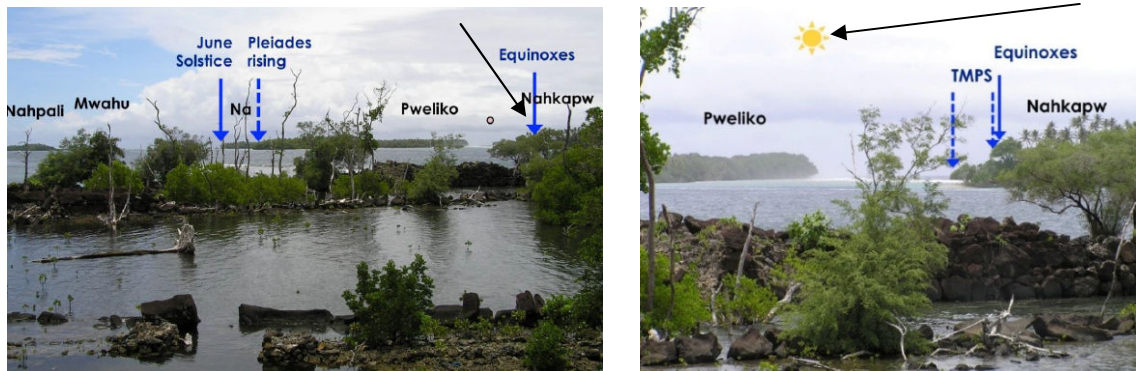


Figure 49. (Left) At Nandauwas looking towards alignments in correlation to key celestial events. (Right) Zoomed in photo noting possible sunrise positions at the temporal midpoint between the solstices (TMPS). Arrow pointing to the sun size in relation to the picture. Images from Esteban's "Orientations and Astronomy..." pg. 176, 177.

2.1.4 Ahu Huri a Urenga (Rapa Nui)

Easter Island is probably best known for its numerous monolithic human figure stones, *moai*. The exact purpose of these stones is still unknown. However, there is one significant site that has astronomical significance. At an *ahu*, or raised altar or platform, named *Ahu Huri a Urenga*, a *moai* sits upon it facing the winter solstice sunrise. The significance of this site was the placement in its relation to the landscape. Not too far from *Ahu Huri a Urenga*, sits a noticeable hill summit where it also aligns with the summer solstice sunrise. There is another prominent hill that marks the autumnal and vernal equinox sunset.⁶² According to Ruggles, the placement of markers at key locations

⁶² Clive Ruggles, *Ancient Astronomy*, pg. 138.

on the landscape that were aligned towards the sun, proved to be validation of the sacredness of the site by the ancient Eastern Islanders.



Figure 50. Ahu Huri a Urenga with a distinctive *moai* atop, facing northeast towards the winter solstice sunrise. Notice the hill summit in the background. source: Google image.

The sacredness of a place is based on the ley line of the sun, the hill summit, and the site itself. The moai's front facing side is aligned towards the winter solstice (tropic of Capricorn), where in the southern hemisphere, is considered long warm days and short nights. Hills were also key physical features in the environment that functioned as markers towards celestial alignments in relation to the center of a site.

2.2 Pacific civic spaces

This section focuses on spaces within the respective of Pacific cultures. There is a similarity of how these spaces were used in a community setting. This observation attempts to connect civic spatial and programming within different indigenous cultures.

2.2.1 Samoan fale

The most prominent architecture in the Samoan culture is the *fale*, best known for its physical features of openness and elaborate curved corners. There are two types of fale.

They are the *fale tele*, or round house and the *fale afola*, or long house.⁶³ Traditionally, the fale is used as a communal space/meeting house where village people and village chiefs make their appearances.⁶⁴ It was common for fale to be the center of a village. Samoan architect Albert Refiti's argued that a Samoan fale being at the center of a Samoan village "controlled and mediated" the mana of the village.⁶⁵ In non-traditional function, the fale is designed to be programmed as institutions such as churches, schools, or a multifunctional building.⁶⁶ Well known throughout modern pacific architecture is the Fale Pasifika, located in Australia. Much like a traditional fale, Fale Pasifika functions as a multi-functional space for the community. A more detailed analysis of Fale Pasifika is discussed in Chapter 4, case studies.

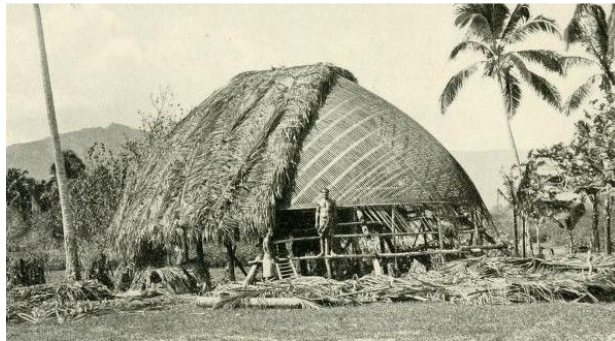


Figure 51. Fale tele. source: <http://commons.wikimedia.org/wiki/File:Fale_Samoa_Construction_1902.jpg>

⁶³ F.L Higginson, *The Samoan Fale*. (Apia, Western Samoa: UNESCO Office for the Pacific States; Bangkok, Thailand : Unesco Principal Office for Asia and the Pacific), 1992.

⁶⁴ F.L Higginson, *The Samoan Fale*, pg. 12.

⁶⁵ Albert Refiti, "The Circulation of *Mana* in Centralised Spaces, Striated Territories and Shimmering Houses in Polynesia," *Pacific Spaces and Sacred Houses Fono #1: Interstices Under Construction Symposium*, (Auckland University of Technology), November 2013. Pg. 7-8.

⁶⁶ F.L Higginson, *The Samoan Fale*, pg. 74.



Figure 52. Fale Afolau source: <<http://village.1samoana.com/profiles/blogs/samoan-history-the-ways-of-our-ancestors>>

2.2.2 Marae

The *Marae* serves the purpose as a communal, social, religious and/or sacred space. In Polynesia, a marae can be compared almost to a heiau in terms of the function of being a sacred and religious space and having protocols of *tapu*, or restrictions. In ancient times, generally in French Polynesia, especially in Tahiti and the Society Islands, a marae was either an international, national, or local. The most notable of the marae throughout Polynesia was *Taputapu-atea*, considered an international marae.

2.2.2.1 Taputapu-atea Marae in Tahiti

Taputapu-atea is located on the windward side of Opoa overlooking a bay of beautiful coral reefs and the ocean. In ancient Polynesia, it was considered the center and most sacred place and was the head of the Ta'aroa octopus.⁶⁷ There sits a sacred passage in ancient times where canoes would enter into Taputapu-atea. According to oral accounts, the structure behind it is a low marae, Taura'a-a-tapu, literally meaning "landing place for sacrifices".⁶⁸ This account of sacrificial activities was described by Teuira Henry from her book, *Ancient Tahiti*:

To Taputapu-atea, the national marae of Ra'iatea, were most of the heads of the warriors, who were decapitated as they lay dead or wounded upon the battle field. The heads were cleaned and closely stacked in rows in the crevices and nooks of the marae,

⁶⁷ Dennis Kawaharada, *Storied Landscapes: Hawaiian Literature and Place*, (Honolulu: Kalamakū Press, 1999), pg. 48.

⁶⁸ Teuira Henry, *Ancient Tahiti*, pg. 120.

where contrasted with the background of stones, they produced a terrible sight. Bleached with age, white skulls lay sacred upon the marae, untouched by native or white residents, until recently, when tourists deemed it not bad manners to repay their native guides by laying on a desecrating hand carrying them away. All those that remained have therefore been secreted by the natives.⁶⁹

Taputapu-atea was also a navigator marae. The abundance of trees surrounding the area made it an attractive place for building canoes. The large ahu of the marae functioned as a platform for the arrival and departure of navigators during long voyages. In 1992, the Hōkūleʻa arrived at the platform of Taputapu-atea and this symbolized a revival of traditional navigational practice throughout the Pacific and Polynesia.⁷⁰ As said before, the marae also functioned as a sacrificial platform. According to Tahitian traditional stories, the origin of human sacrifice in Polynesia originated from a marae located in Opoa.⁷¹ The marae behind the voyaging platform, functioned as a ritual area. During night time, a fire from the platform functioned as a beacon of light for the navigators.⁷²

Being that the Taputapu-atea is an international marae, it received international acclaim being recognized throughout Polynesia as one of the houses of knowledge and seating of royal chiefs.⁷³ Dennis Kawaharada explained that the priests of Opoa frequented Taputapu-atea, bringing with them knowledge of religion, navigation, oratory knowledge, genealogy, geography, heraldry and astronomy. Scholars were so attracted to this knowledge that voyagers from afar would travel to Taputapu-atea to gather this information to spread it to other islands.⁷⁴

⁶⁹ Teuira Henry, *Ancient Tahiti: Bulletin 48*. (Honolulu, Hawaii: Bernice P. Bishop Museum, 1928), pg. 121.

⁷⁰ Dennis Kawaharada, *Storied Landscapes*, pg. 49.

⁷¹ Dennis Kawaharada, *Storied Landscapes*, pg. 59.

⁷² David Stanley, *Tahiti: Including the Cook Islands*, (USA: Avalon Travel, 2011), pg. 210-211.

⁷³ Teuira Henry, *Ancient Tahiti: Bulletin 48*. (Honolulu, Hawaii: Bernice P. Bishop Museum, 1928), pg. 119.

⁷⁴ Dennis Kawaharada, *Storied Landscapes*, pg. 59-60.



Figure 53. (Left) Raiatea island context. Satellite view of Marae Taputapu-atea off the Opoo coast. Google satellite map.



Figure 54. Marae temple, Taura'a-a-tapu, used for human sacrifice and other rituals as described by Henry. Google image.



Figure 55. Marae temple Taputapu-atea, overlooking the ocean. Google image.

Reflection

Civic spaces of Samoa and Tahiti provide us with clues to its important to the Polynesian peoples. The common denominator of these spaces is its presence in functioning out in the open. There was also a sense of important events at these spaces contributing to the community on a local, national and international level. In Samoa, a fale is known as a communal space for making decisions. In Taputapu-atea marae, it was considered a royal place of knowledge and an altar for preparation for departure and arrival of navigators.

2.3 Navigation and alignments

In ancient times, navigation of short and long distances was a common practice. Cultural historians believed these navigators recognized over 150 stars. As previously stated in Chapter 1, the ancients observed the patterns of movements of these celestial objects in the sky. In the Pacific throughout Melanesia, Micronesia and Polynesia, observance of these patterns mastered by navigators evolved into skills of aligning constellations towards navigating and deliberately targeting landfall.

Ancient voyagers were the pioneers of traveling the sea and perfected the technique of traditional navigation using the stars, sun, ocean swells, birds and wind patterns. The voyagers used doubled hulled canoes. This type of navigation had been a lost art in Pacific cultures. The last known ancient story that involved long distant voyaging was that of Pā'ao, a priest of royal blood. Hawaiian Historians such as Sam Kamakau and David Malo have recorded navigational stories involving Pā'ao's traveling long distances between Hawai'i and other islands. In modernity, the last Pacific Islander to have known the ancient techniques of ancient navigation and was willing to share them was Mau Piailug of the Western Pacific island of Satawal, Micronesia.⁷⁵

⁷⁵ "The Navigators: Pathfinders of the Pacific," YouTube video, 57:49, (Posted by "Mau Piailug Society", February 16, 2012), <https://www.youtube.com/watch?v=uxgUjyqN7FU>

In a documentary video, *The Navigators: Pathfinders of the Pacific*, Mau explains that in his home island of Satawal, resources are limited. It was a need to venture to the sea to gather more resources from nearby islands. With the use of no instruments, Mau saw it as crucial for navigators to be experts in knowing the stars, ocean swells and noting bird activity to be able to survive in the open sea.⁷⁶ The following star compass (Figure 58) is used in Mau's teaching of navigation to his pupils.

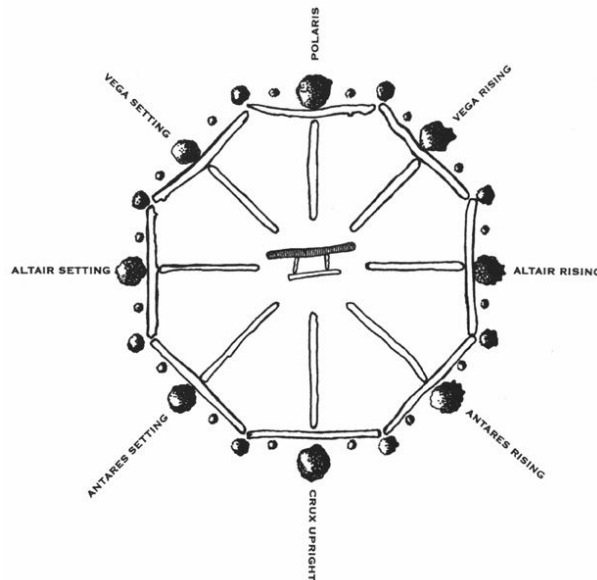


Figure 56. Mau's star compass. source:

<http://www.jps.auckland.ac.nz/document//Volume_104_1995/Volume_104_No_2/A_reinterpretation_of_the_Micronesian_%26apos%3Bstar_compass%26apos%3B_by_Charles_O._Frake,_p_147-158/p1 >

Mau's star compass for educational uses consists of a hexagon shape with large coral rocks placed at each side depicting the North Star and the rising and setting of important stars. Three smaller rocks are evenly spaced between them, totaling thirty-two pieces. This was the essential teaching tool that Mau's grandfather and father used while he was very young.⁷⁷

Mau's voyages were done using a traditional double hulled canoe, called Hōkūle'a, As the lead Navigator of the Hōkūle'a, nicknamed "Star of Gladness" named

⁷⁶ "The Navigators: Pathfinders of the Pacific", YouTube video, 57:49, (Posted by "Mau Piailug Society", February 16, 2012), <https://www.youtube.com/watch?v=uxgUjyqN7FU>

⁷⁷ Ibid.

after Hawaii's zenith star, Arcturus,⁷⁸ Mau made a voyage in 1976 from Hawai'i to Tahiti. The Hōkūle'a successful 2,500 mile trip proved that ancient Polynesians used astronomical voyaging for traveling through the Pacific Ocean.⁷⁹ Mau's Hawaiian student, Nainoa Thompson, learned a lot from his master during their continued Hōkūle'a voyages and adopted his own star compass that was more in relation to Hawaiian star names and directionality (Figure 55).

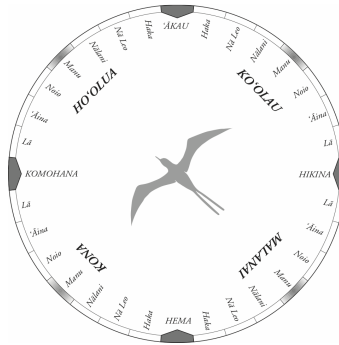


Figure 57. The Hawaiian star compass by N. Thompson. source:
http://pvs.kcc.hawaii.edu/ike/hookele/holding_a_course.html

Reflection

Pacific islanders observed the skies daily, noting the rising and setting of the sun, moon, and stars. Structures were selectively placed at key sites in relation to alignments and towards important islands. Those of the solstices marked seasonal changes, enabling farmers and fishers to follow the cycles of the environment. Gathering spaces are an integral part of Pacific society where the fale and marae were key houses for decision making and the sharing of knowledge.

The value of the lessons learned from this chapter provides important insight to the similarities of how different cultures around the world view and observe celestial alignments and integrate them into their daily lives, especially when living in a sustaining environment where resource can be scarce. Chapter two paves the way to chapter three on a more detailed account of how the Hawaiians use alignments within their cultural life style.

⁷⁸ Dennis Kawaharada, *Storied Landscapes*, pg. 33.

⁷⁹ "The Navigators: Pathfinders of the Pacific," YouTube video, 57:49, (Posted by "Mau Piailug Society", February 16, 2012), <https://www.youtube.com/watch?v=uxgUjyqN7FU>

Chapter 3 : Hawaiian Alignments

Hawaiians had different schools of sciences that required observance of the sky, the land, the flora and the fauna. These observations formed the structure of the Hawaiian culture. These schools of thought had multiple layers, and this concept is called Papakūmakawalu and is a way of perceiving things in a holistic manner in an indigenous context. This chapter focuses on Hawaiian observation of alignments taking the concept of Papakūmakawalu, especially Papahulilani, as it relates to the celestial sky and its relation to the natural elements, the Hawaiian culture, architecture and the heiau in particular.

3.1 Papakū Makawalu

Papakū means foundation of the sun, moon, the family and self ;"Papa", meaning level, flat surface, stratum, foundation and "Kū", meaning to establish, to stand, or anchor. Makawalu means infinite in movement, evolution, transformation. "Maka", which translates to a beginning source, a descendant, to disperse into many. "Walu" translates to the number eight (multiples of four are sacred numbers), many, much.⁸⁰ Papakū Makawalu cumulatively means a foundation from which to evolve, establish and multiply infinitely.

Papakū Makawalu has three major houses of knowledge: (1) Papahulilani, (2) Papahulihonua and (3) Papahānaumoku. These are the Hawaiian sciences that convey knowledge and intellect of the Hawaiian universe. It is a natural process that involves the return of a higher level of existence, thus its interpretation is as "a foundation of constant growth" for the Hawaiian way of living.⁸¹

Papahulilani is the study of the spatial atmosphere in the sky, namely the sun, moon, stars, winds, the measurement of the space above horizontally and vertically and the energy sources of the atmosphere.⁸² More importantly, it is the observation of the impact it has on the islands. Papahulihonua is considered to be the movement and process and is the reason for the existence of Papanuihānaumoku. Papahulihonua's components

⁸⁰ Edith Kanaka'ole Foundation, *Kūkulu Ke Ea A Kanaloa*, pg. 32-33.

⁸¹ Edith Kanaka'ole Foundation, *Kūkulu Ke Ea A Kanaloa*, pg. 32-33.

⁸² Edith Kanaka'ole Foundation, *Kūkulu Ke Ea A Kanaloa*, pg. 36.

are the moving ocean, the formations of the earth, fresh water and all measurements of space on sea and land vertically and horizontally⁸³. It is the observance of the earth that we live on and the environment that is the landscape and the surrounding hills and mountains, the ocean and the surrounding beaches. Papanuihānaumoku exists only with the interaction with Papahulilani⁸⁴. Papanuihānaumoku is the third house of knowledge, and represented the cyclic of birth, reproduction, regeneration and procreation.⁸⁵

The main concept of Papakū Makawalu that is useful for this project is its holistic worldview in a Hawaiian sense, in that every element is dependent on each other. The sun, moon, and stars all have an effect on the land especially the movement of the earth and the sea and the life cycles of all living things on the earth. These multiple layers create environments in which a person can observe and learn from and master these sciences, especially that of Papahulilani. Through these observances, kahunas, farmers and fishers are able to predict patterns of the seasonal cycle and have continued success towards a subsistent life style.

3.2 Observance of the sky

The concept of the Papahulilani School of Science is based on observing the universe and the movements of the sun, moon and constellations, studying how these affected the movements of elements on the earth and life cycles of all living things on the earth. This section takes a look at the major celestial bodies and how and why the Hawaiians observed them in creating a foundation of cultural knowledge.

3.2.1 Sun and directionality

In ancient Hawai'i, the sun was an important element in the daily lives of the Kanaka Maoli. They called the sun the chief of all the stars and "the great sun of Kane."⁸⁶ The sun acted as a marker of the seasons and the ancients would build structures to create a calendar that signified important seasons for planting, reproduction and harvesting over

⁸³ Edith Kanaka'ole Foundation, *Kūkulu Ke Ea A Kanaloa*, pg.65.

⁸⁴ Edith Kanaka'ole Foundation, *Kūkulu Ke Ea A Kanaloa*, pg.65.

⁸⁵ Edith Kanaka'ole Foundation, *Kūkulu Ke Ea A Kanaloa*, pg. 147.

⁸⁶ Martha Warren Beckwith, *Kepelino's Traditions of Hawaii*, (Hawaii: Bishop Museum Press, 2007) 80.

the course of the year. Through years of observation, the scientist-priests were able to predict changes in weather patterns, the movements and condition of various natural elements and the life cycles of living creatures as the seasons changed.

Through observation of the rising and setting of the sun, Hawaiians maintained directional orientation. The rising of the sun is called Kūkulu hikina, or east and the setting of the sun is called Kūkulu komohana, or west. Facing towards the sunset, the left hand, hema, pointed Kūkulu hema, or south and the right hand, 'ākau, pointed towards Kūkulu ākau, or north.⁸⁷ These were the orientations of the cardinal points based on the manner of the rising and setting of the sun.

In the manner of orienting one's self on an island, positioning was based on using the mountains to seas. A person on the west side of the island refers east towards inland and west towards the sea, giving the direction of mauka, towards the mountain and makai, towards the sea (see figure 58).⁸⁸

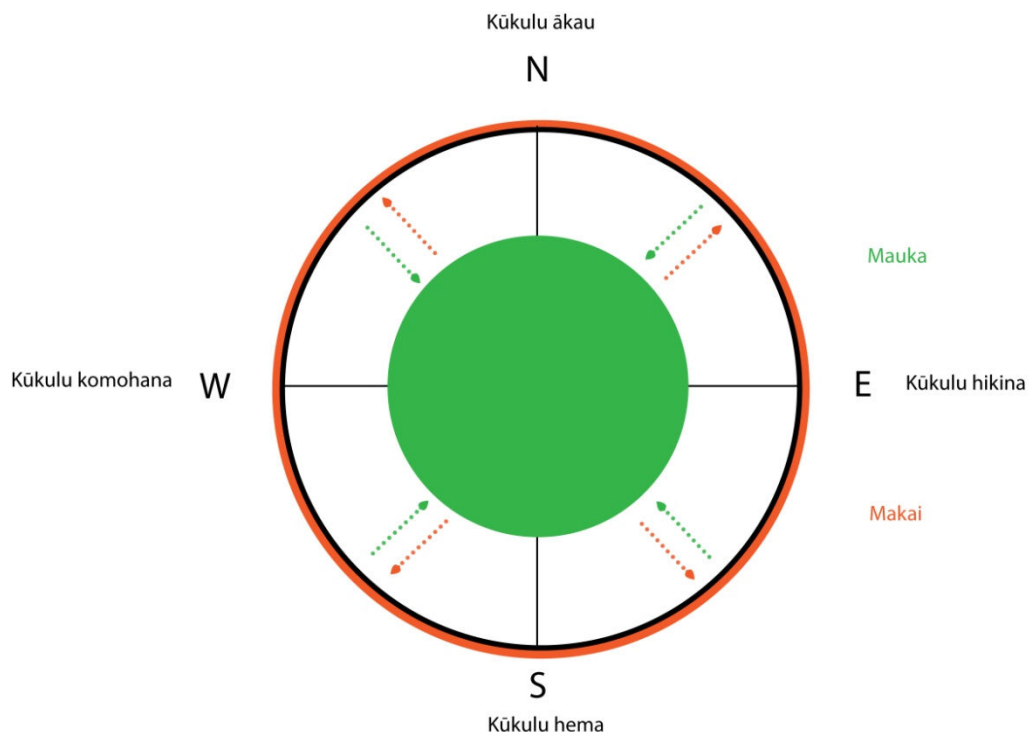


Figure 58. Diagram of cardinal directions and land to sea orientation. Produced by the author.

⁸⁷ Davida Malo, *Ka Mo'olelo Hawai'i*, (Hawaii: Kapiolani Community College, 1987), 146.

⁸⁸ Charles W. Kenn, *Mo'olelo of Ancient Hawai'i*, (Honolulu, Hawaii: Topgallant Publishing Co., Ltd., 1978)

Hawaiians also noted two seasons based on special observation of the sun. These observations occurred four times during the Hawaiian calendar year and were the time of the solstices and equinoxes.⁸⁹ This acquired the naming of these events with the four main Hawaiian gods Kū, Lono, Kāne and Kanaloa and its relation to the wet and dry seasons. These gods are further discussed later in this chapter.

During the wet season following the autumnal equinox (September 21), the sun travels south on the latitudinal coordinate 23.5 degree below the equator to **Ao Polohiwa a Kanaloa** (tropic of Capricorn); this is Kanaloa's ruling season.⁹⁰ During the dry season following the vernal equinox (March 21), the sun travels north on the latitude coordinate 23.5 above the equator to **Ao Polohiwa a Kāne** (tropic of Cancer); this is Kāne's ruling season.⁹¹ During the Autumnal and Vernal equinoxes (September 21 and March 21) when day and night are equal and the sun sets and rises due east and west, both gods Kāne and Kanaloa are in existence together.⁹² This is called **Ka Piko o ka honua** (see figure 59) and is the center or the equator. The autumnal equinox marks the transition towards the Lono season, a time of peace, with the sighting of the Makali'i (Pleiades) constellation. The vernal equinox marks the transition towards the Kū season with the sighting of the Mānaiakalani (Scorpius) constellation.

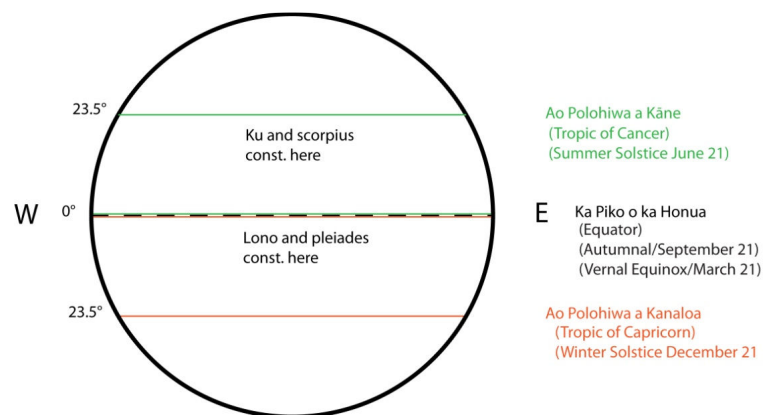


Figure 59. Graphic depiction of *Ao Polohiwa a Kanaloa* and *Ao Polohiwa a Kāne* as it relates to the coming of seasons in the Hawaiian calendar year. Created by author.

⁸⁹ Sam Kamakau, *The Works of the People of Old*, 14.

⁹⁰ Edith Kanaka'ole Foundation, *Kūkulu Ke Ea A Kanaloa*, pg. 36.

⁹¹ Edith Kanaka'ole Foundation, *Kūkulu Ke Ea A Kanaloa*, pg. 36.

⁹² Edith Kanaka'ole Foundation, *Kūkulu Ke Ea A Kanaloa*, pg. 38.

Site placement

Much like Chinese geomancy, the sun and its relation to the surrounding landscape also played an important role in divination and choosing of a site in erecting a heiau. A kāhuna kuhikuhi pu'uone, or Hawaiian architect, had the responsibility of choosing such sites. Many of these sites were deemed sacred and were called wahi pana, or sacred sites.

David Malo explains the accounts concerning the Kuhikuhipu'uone as a person who divined a location for a heiau. This profession was well respected for divining a proper heiau.⁹³ The kahuna Kuhikuhipu'uone had a responsibility to be advisory for the location of structures, heiaus and fish ponds as they were professional architects.⁹⁴ A later section of this chapter focuses on heiau spatial elements based on celestial alignments and context to surrounding landscape.

Much of site placement is dependent on directionality in the vertical and horizontal atmospheres and the movement of celestial bodies. Physical aspects of the landscape such as a hill or mountains that are peaked in the high stratosphere of the gods are considered sacred as well.

Piko

The word piko has many meanings. For one, it is associated with the umbilical cord of a new born child. In ancient Hawai'i, during the birth of a royal child, the piko was cut and deposited in a pohaku piko, or navel stone, ensuring great health for the new born. This is also associated with divination of a sacred place. Hawaiian scholars also mentioned the piko as the center; center of origin or center of an area such as an island. An example is Pu'u o Kapolei being the piko of Kapolei because its key characteristic is a volcanic cone and sets a seasonal marker for the sun.⁹⁵

⁹³ David Malo, *Ka Mo'olelo*, pg. 61.

⁹⁴ David Malo, *Ka Mo'olelo*, 123.

⁹⁵ Shad Kane interview.

3.2.2 Ka Mahina (Moon)

The study of the moon is just as important to the Hawaiians as the study of the sun. Hawaiians observed the moon and noted the cycles as it correlated with the Hawaiian seasonal changes.⁹⁶ Hawaiian farmers, fishers and scientists observed these influences throughout various phases of the moon and developed a lunar calendar. The purpose for doing so is the moons relevancy to seasonal changes and the effect it has on plants and animals, for example, noting the best time for producing a certain plant or the best time for fishing.

Ka Mahina consists of twelve lunar months and is separated into two different seasons. The First season is Ho'oilu (wet season) and has six lunar months:⁹⁷ These months are (1) Welehu, (2) Makali'i, (3) Kā'elo, (4) Kaulua, (5) Nana, (6) Welo.

The second season, Kau (dry season) has six lunar months: (1) Ikiiki, (2) Ka'aona, (3) Hinaia'ele'ele, (4) Hilinaehu, (5) Hilinamā, (6) 'Ikuā.⁹⁸

There are 30 lunar phases that Hawaiians recognized, memorized and named based on their physical features. A Hawaiian lunar week, anahulu, is ten days; three anahulu occurs in one Hawaiian lunar month.⁹⁹ The initial anahulu is described as the growing of the moon. This is Anahulu Ho'onui, consisting of ten moon phases: (1) Hilo, (2) Hoaka, (3) Kūkahi, (4) Kūlua, (5) Kūkolu, (6) Kūpau, (7) 'Olekūkahi, (8) 'Olekūlua, (9) 'Olekūkolu and (10) 'Olepau. The second anahulu is considered as fully round. This anahulu is called Anahulu Piha Poepoe, with ten moon phases consisting of (1) Huna, (2) Mōhalu, (3) Hua, (4) Akua, (5) Hoku, (6) Māhealani, (7) Kulu, (8) Lā'aukūkahi, (9) Lā'aukūlua and (10) Lā'aupau. The third anahulu is described as decreasing. This is called Anahulu Hō'emi, with ten moon phases consisting of (1) 'Olekūkahi, (2) 'Olekūlua, (3) 'Olepau, (4) Kāloakūkahi, (5) Kāloakūlua, (6) Kāloapau, (7) Kāne, (8) Lono, (9) Maui and (10) Muku.¹⁰⁰

⁹⁶Edith Kanaka'ole Foundation, *Kūkulu Ke Ea A Kanaloa*, pg. 54

⁹⁷Edith Kanaka'ole Foundation, *Kūkulu Ke Ea A Kanaloa*, pg. 54

⁹⁸Ibid 54.

⁹⁹Ibid 54.

¹⁰⁰Edith Kanaka'ole Foundation, *Kūkulu Ke Ea A Kanaloa*, pg. 58

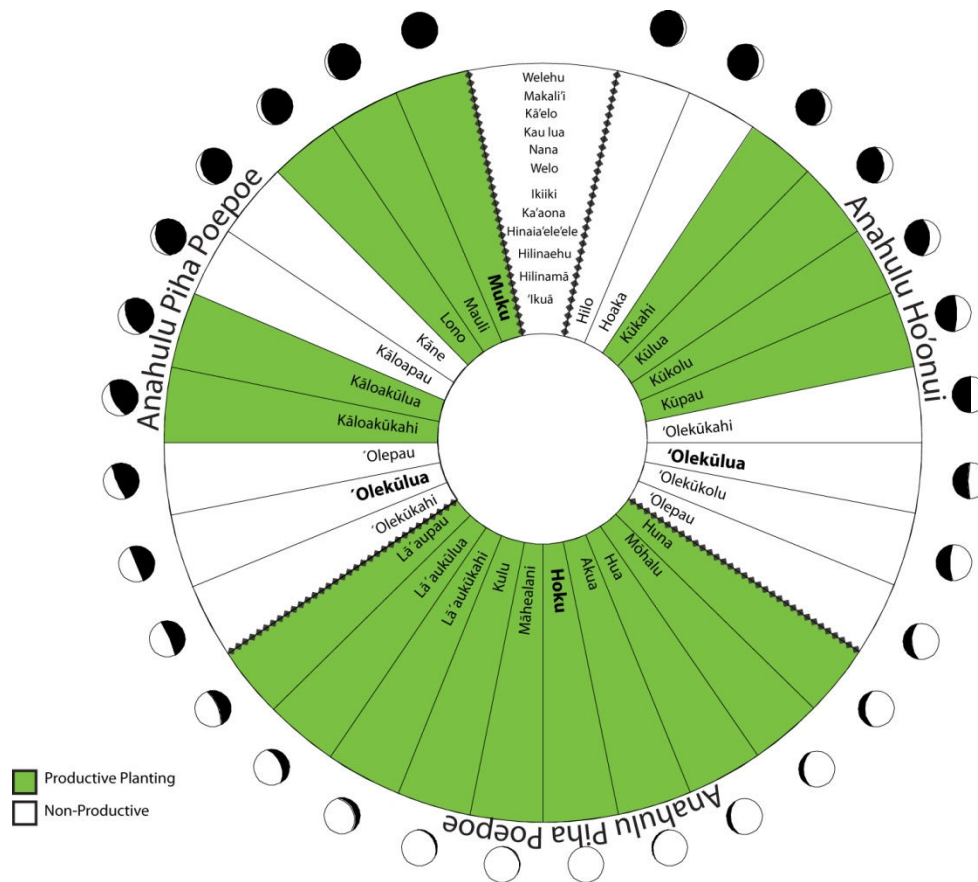


Figure 60. Hawaiian lunar Chart depicting the productive and non-productive times for planting. Created by author.

The study of lunar cycles also fostered Hawaiians to create elaborate moon calendars in the form of oral language and aided in their occupations, showcasing the best and worst time for production. For example, Katrina-Ann Oliveira explained the "...Hua' (egg, fruit, seed) was given to a night that resembles the shape of an egg and is noted for producing excellent fruit crops with bountiful harvests..."Huna" (hidden) was given for an excellent night to fish..on this particular night, marine life can be easily caught, as fish are prone to remaining in their holes."¹⁰¹

The moon phase Kāloa Kū Kahi and Kāloa Kū Lua were best nights for planting crops that were to be desired long such as banana's, sugarcane, vines or bamboo. Ingrained in the name Kāloa is "loa", meaning long. Conversely, moon phases with the

¹⁰¹ Katrina-Ann Oliveira, *Ancestral Places*, pg. 106-107.

name "ʻole" means bad and not good; these nights are unproductive for fishing and farming.¹⁰²

Observation of the moon also tracked the seasons of the year. There are two seasons in a Hawaiian year, Makaliʻi and Hoʻoilō. During the summer season months farming, fishing, hunting and gathering were ideal. During the winter season comprising of wetter months, indoor tasks such as basket weaving, tool making and creating cord were ideal. Certain animals and plants also reacted differently towards the cycles of the moon. The Hawaiians would observe these natural phenomena carefully and apply these to their daily activities.¹⁰³

3.2.3 Stars and Constellations

Hawaiians also studied the stars regarding positioning, patterns and the effect on the environment. Observance of these astral patterns also predicted events such as rain, earthquakes and even time. Important stars marked the seasons as well. As described earlier, Makaliʻi (Pleiades) and Mānaiakalani (Scorpius), marked the course of the transition of the Lono and Kū seasons respectively. Most notably the Lono season is between October and February and marks the Makahiki or the Hawaiian New Year. It is a time of wet season, abundance and fertility. The Mānaiakalani is a celebration within Hawaiian politics and starts on the vernal equinox (March 21).



Figure 61 Pleiades constellation. Google image.

¹⁰² Katrina-Ann Oliveira, *Ancestral Places*, pg. 106-107.

¹⁰³ Katrina-Ann Oliveira, *Ancestral Places*, pg. 106-107.

Navagation

Apart from marking seasonal changes, memorization of the stars was important, especially when geared towards navigation. Over 300 stars were identified by Rubellite Johnson in her book, *Nā Inoa Hōkū: A Catalogue of Hawaiian and Pacific Star Names*.¹⁰⁴ In Hawaiian myths, a kahuna, or priest, by the name of Pā'ao, traveled long voyages using the star constellations.¹⁰⁵ The most well known Hawaiian navigator today is Nainoa Thompson, who created an elaborate Hawaiian star compass noting important star constellations used for non-instrumental navigation (figure 62).

This Hawaiian star compass consists of thirty-two directional points evenly spaced 11.25 degrees apart, within a circle divided by the cardinal directional points. In these four quadrants, the horizontal elements are given their Hawaiian names in relation to the wind patterns: Ko'olau (north east) for the NE quadrant, Malanai the SE quadrant, Kona the SW quadrant and Ho'olua the NW quadrant.¹⁰⁶

Each quadrant has seven directional houses of the same name. The following are the houses from 1 to 7, given their Hawaiian names in relation to their orientation and context:

(1) La, or sun stays within this house as its limits of movements are between the tropic of cancer (23.5 degrees above equator) and the tropic of capricorn (23.5 degrees south of equator).

(2) Aina, or land is a house that is located between 17 degrees and 28 degrees on the east and west horizon and it is in reference to the home land

¹⁰⁴ Rubellite K. Johnson, *Nā Inoa Hōkū: A Catalogue of Hawaiian and Pacific Star Names*, (Honolulu, Hawaii: Topgallant Publishing Company, LTD., 1975), pg. vii.

¹⁰⁵ Davida Malo. *Ka Mo'olelo Hawai'i*, (Honolulu, Hawai'i: First People's Productions, 2006), pg. 143.

¹⁰⁶ Hawaiian Voyaging traditions, "Holding a Course", Accessed August 9, 2015.
<http://pvs.kcc.hawaii.edu/ike/hookele/holding_a_course.html>

of the navigators, Hawai'i at 21 degree N latitude, and Tahiti at 18 degree S latitude.

(3) Noio, the Hawaiian tern seabird, helps Polynesian navigators find land. They travel out in mornings to fish going a distance of 40 miles and return to land to rest during nights.

(4) A Manu, or bird, is located midway between the cardinal directions and are oriented with the points of the beak, tail, and outstretched wings. In traditional Polynesian navigation, the bird represents the canoe. The orientation of the bird also notes the traditional travel of the Hōkūle'a with the direction of the south east wind, Malanai.

(5) Nālani, the name of the house that has the brightest Hawaiian star, Ke ali'i o kona i ka lewa (canopus), rises in Nālani Malanai and sets in Nālani Kona.

(6) Nā Leo, or the voices, refers to the stars speaking to the Hawaiian navigator.

(7) Haka, or empty, refers to the empty sky near the north and south celestial poles as observed from Hawaiian Historian, Sam Kamakau.¹⁰⁷

Combining these directional houses with the cardinal directions totals to thirty-two compass directions. If a navigator was traveling in the east by north quadrant in the direction of Lā, the compass direction is Lā Ko'olau. If a navigator was traveling in the

¹⁰⁷ Hawaiian Voyaging traditions, "Holding a Course", Accessed August 9, 2015.
<http://pvs.kcc.hawaii.edu/ike/hookele/holding_a_course.html>

and became useful in navigation and orientation of the sea as well as the land. The moon allowed Hawaiians to create elaborate calendars, that by observing the shape of the moon, allowed farmers and fishers to plant and harvest in accordance to the seasonal cycles.

To record these events, Hawaiians built structures that aligned with important celestial patterns. Chants were also written to record stories of cosmic phenomena in the form of mo'olelo mo'okū'auhau, or creation genealogical stories, which there are many of.

Learning about this information begins the process of understanding the connection between the celestial objects and daily activities that the Hawaiians dedicated themselves to. Information is available on Hawaiian knowledge and cultural lifestyle that relates to the celestial phenomena.

Creation stories and place names

Observation of celestial phenomena allowed Hawaiians to succeed in their discipline. With masterful observation, they recorded events in the form of chants. One variety of these chants was the mo'olelo mo'okū'auhau, or genealogical stories. Hawaiians also paid close attention to a place and recorded names of places according to events which occurred there. This section focuses on a few creation stories, particularly the Kumulipo and the Papa and Wākea chants.

Kumulipo

The Kumulipo is a Hawaiian creation chant depicting the birth of the land and creatures in Pō , darkness, and the birth of gods and humans in Ao, lightness.¹⁰⁸ There are many ambiguous meanings within the chant that allows room for personal interpretation. But what remains consistent is the concept of duality that contributes to the cosmic creation.¹⁰⁹

¹⁰⁸ Martha Beckwith, *The Kumulipo*, 37.

¹⁰⁹ Katrina-Ann Oliveira, *Ancestral Places*, 24.

Pō and Ao

The Kumulipo has 16 periods of time, or wā, divided into two parts: 7 wā are of the Pō, 9 wā are Ao. Pō is associated with the spirit world and during this time, creation of the first man, woman, and creatures born of darkness occurred. Wā 8 sees the day, Ao, and born was the first human, a woman by the name La'ila'i. A man name Ki'i was born thereafter. After wā 8, in wā 9 the earth is born. The later wā's involved humans procreating with gods and the creation of the genealogy of demi-gods and high chiefs.

Papa and Wākea

The creation story of Papa and Wākea originates from the Kumulipo of wā 13 and 14. Papa, meaning flat surface, symbolizes the female, the warm layers of the earth where the seeds of life await. Wākea, meaning sky, symbolizes the male and is the sunshine and rain that fertilizes the seeds. According to Hawaiian scholars, both Papa and Wākea are the first parents to the Hawaiians and the aina and ancestors to the chiefs.¹¹⁰

Reflection

Creation stories are a result of ancient Hawaiians observing the environment surrounding them. These stories are incredibly valuable and are essential for genealogy records. They have been passed down from generation to generation and are an important educational tool for learning the origins of the Hawaiian people. For people of Hawaiian decent, observation is one of the most important aspects of learning. Shad Kane, caretaker of Kalaeloa Heritage Park, mentions that observation of the sea, land and sky were the schools for the Hawaiians. From observing keenly the cycles of the natural phenomena, students then become kahuna or masters.¹¹¹ Observation is an important educational tool and is essential in Hawaiian cultural practice, especially when it comes to living in sustenance.

3.3 Observance of the earth and sea

Hawaiians were observant of the earth they lived on, noticing the landscape and the surrounding hills, mountains, ocean and beaches. In the accounts from *Na Hana a ka*

¹¹⁰ Katrina-Ann Oliveira, *Ancestral Places*, 5.

¹¹¹ Shad Kane interview.

Po'e Kahiko: The Works of the People of Old, Kamakau described zones for mountains, hills and inland. The highest place of a mountain where it meets the clouds is called mauna. The sharp point of a mauna was the piko or pane po'o. Below that is an area called kuahiwi. High places or hills are called pu'u. Valleys are called awawa. The grasslands are named 'apa'a. Open country is called kula. The coast is called kahakai; sandy beaches are kahaone; the curve of the seashore is called kalawa and the water's edge is 'ae kai. These are the zones from mauka to makai observed from the Hawaiians and used in orienting one's self on the island.¹¹²

There were also observances of the waters that flowed through the mountains. The source of a stream is called po'owai. A stream flowing from the main source is called kahawai. Water that flows slowly is called muliwai. Where the muliwai meets the sea is named nuku muliwai.¹¹³ When houses and villages are located near the sea where the beach curves it is called kalawa kahaone.¹¹⁴

There are also observed accounts in relation to the sea, waves and tides. But the main idea behind the Hawaiians observation was how they used these natural elements in the procreation of plant and water species, mainly with taro, known as kalo, sweet potato and the awa fish.

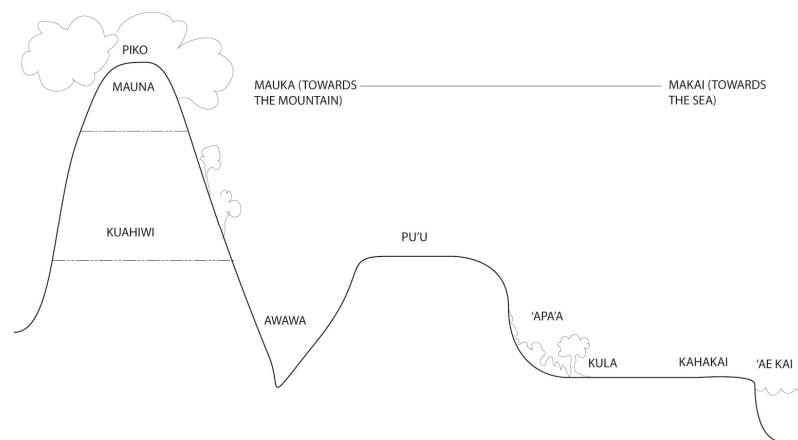


Figure 63. Simple diagram depicting the zones as explained by Kamakau. Created by author.

¹¹² Sam Kamakau, *Na Hana a ka Po'e Kahiko: The Works of the People of Old*, (Honolulu: Bishop Museum Press, 1976), pg. 8-9.

¹¹³ Kamakau, *Na Hana a ka Po'e Kahiko: The Works of the People of Old*, pg. 10.

¹¹⁴ Kamakau, *Na Hana a ka Po'e Kahiko: The Works of the People of Old*, pg. 11.

Reflection

Understanding the value of observing the earth and sea is an incredible lesson, highlighting the importance of the relationship between mauka and makai. The duality between the two has a powerful connection between resources of the sea and land, the people, plants, animals and deities.

3.4 Observance of birth and creation

In many chants, mo'olelo depicts observations of the creation and procreation of stars, land, sea, living creatures and plants, humans and deities. The story of Papa and Wākea from the Kumulipo, tells of the birth of the first kalo. Sky father, Wākea and earth mother, Papa, reproduced and created the first kalo, and the first human. Papa also produced the Hawaiian islands.¹¹⁵ There are other female figures depicted in the Kumulipo, including the important female goddess, Hina. Hina symbolized the female in reproduction and creation. In the Kumulipo, Hina encountering Wākea resulted in the production of the sea creatures. Hina also conceived the demi-god, Maui. Hina also has a strong connection with the moon, so farmers predicted the best time for planting based on the phases of the moon.¹¹⁶

The story of Papa and Wākea is an example of observation of a birth and the influence the environment had upon creation. As Beckwith explains in *The Kumulipo*, both are the "...first parents of human life on earth as they are of plant life that springs from earth under the influence of sun and rain from heaven and of animal life that feeds upon it."¹¹⁷

Another important element of birth is the umbilical cord, or piko, mainly because it connects the child and mother. In Hawaiian thinking, the placement of the piko was considered as registering a birth, connecting the new born with ancestors and the land.¹¹⁸

¹¹⁵ Martha Beckwith, *The Kumulipo, A Hawaiian Creation Chant*. (Honolulu: University of Hawaii Press, 1981), pg. 118.

¹¹⁶ June Gutmanis, *Na Pule Kahiko, Ancient Hawaiian Prayers*, (Honolulu: Editions Limited Publisher, 1983), pg.8.

¹¹⁷ Martha Beckwith, *The Kumulipo*, (Honolulu: University of Hawai'i Press, 1972), pg. 117.

¹¹⁸ Barrere, Pukui and Kelly, *Hula: Historical Perspectives*, 103.

The idea of the piko has also translated into the building of a hale, or house. In the blessing of the hale, a ceremony takes place in which the piko takes the form of a bundle of thatching. The purpose of this is to consecrate the hale to ward off evil influences upon the owners and users.¹¹⁹ The ceremony may happen before or after the structure has been built, where a series of prayers follow the cutting of the piko.¹²⁰

Reflection

The observance of birth and creation in the Kumulipo depicts the importance of procreation. Like their gods who created life forms, Hawaiians believed in procreation of continued genealogy, plant and animal life. The piko was important in creating continuity between the new born and the ancestral lands. The cultivation of plants such as the kalo, sugarcane, banana, and sweet potato (to name a few) were important in supplying resources for the kanaka maoli. It was so important that the Hawaiians associated plant and animal life as manifestation of deities. Hawaiians associated these forms with their akua in the context of plants and natural phenomena which were categorized into systems of energy. The next section focuses on the portrayal of the main gods in their personified manifested physical and non-physical form.

3.5 Manifestation of the Major Deities

With observations of the universe recorded in chant form, the Hawaiians also personified deities with natural phenomena and elements. In Hawaiian history, it is important to note that there are many creation stories depicting numerous gods. This section looks at major Hawaiian deities in the form of manifestations or kinolau which play a role in Hawaiian spirituality and culture.

Gods are known to be chief dwellers, traveling far throughout the lands as visitors to a sacred location for worshipping.¹²¹ The great gods of Polynesia are Kū, Kāne, Lono, and Kanaloa. In Martha Beckwith's, *Hawaiian Mythology*, she explains in detail the main Hawaiian gods Kū, Hina, Lono, Kāne and Kanaloa and tells of Hawaiian mythologies that are associated with these gods.

¹¹⁹ Handy, E.S.C, *Ancient Hawaiian Civilization*, pg. 69.

¹²⁰ June Gutmanis, *Na Pule Kahiko*, pg. 57-58.

¹²¹ Martha Beckwith, *Hawaiian Mythology*, (Honolulu: University of Hawai'i Press, 1970), pg. 3.

Kū and Hina:

Kū is the god of war and is considered one of the main gods among the four. His aggressive nature makes him a great protector for many Hawaiians. Kū's kinolau, or many forms can be the coconut tree, the breadfruit tree, 'ohi'a lehua, and the koa tree.¹²² A deity that is associated with Kū is Hina.¹²³

Kū and Hina are one of the earliest gods, having represented the earth and the heavens. Kū is associated with the male and is depicted with an emphasis on standing upright. Hina is associated with the female and has an emphasis on leaning down. In astronomical conceptual interpretation, the rising of the sun is Kū and the setting of the sun is Hina. The prayers towards Kū and Hina are for the gathering of medicinal herbs and for protection of the family.¹²⁴

Additionally, Kū and Hina represent east and west and manifest as man and women. In a public lecture, a Hawaiian practitioner, Kalei Nu'uhiwa, described that East was the manifestation of Kū and west was the manifestation of Hina. During mid-day the sun is at zenith and becomes the meeting point of both Kū and Hina. Nu'uhiwa also mentions it was a period when both gods are genderless and happens just before the sun transitions west.¹²⁵

Lono:

Lono is the god of the clouds and can bring signs of the phenomena of storms. During ancient Hawaiian practice priests would pray to the god Lono for rain, a bountiful harvest of crops and protection from sickness. In daily practice for the common Hawaiian people a food gourd was symbolic of Lono and was used for family prayers. Each Hawaiian family kept a food gourd full of food, especially of fish and 'awa and placed them outside, hung by strings and attached to a stick. During the mornings and evenings,

¹²² June Gutmanis, *Na Pule Kahiko, Ancient Hawaiian Prayers*, (Honolulu: Editions Limited Publisher, 1983), pg. 146.

¹²³ June Gutmanis, *Na Pule Kahiko*, pg. 4.

¹²⁴ Martha, *Hawaiian Mythology*, pg. 30.

¹²⁵ Nu'uhiwa, Kalei. Hawaiian Constructed Sites Were Based on the Moon, the Stars and the Sun (Public lecture, ARCH 451, University of Hawai'i at Mānoa, School of Architecture, Honolulu, February 21, 2012).

a person of faith within the family would take down the gourd and close to the entrance of the hale while facing outward, would pray for the good of his family and all chiefs and commoners.¹²⁶

Lono is closely associated with the production and fertility of agricultural crops and the renewal of the elements of the natural. The forms that pose as Lono are the wet season, heavy rain, rain clouds, gourds, pigs and sweet potatoes. In the form of Lono-puha (Lono of the swelling), he can be associated with many medicinal plants and used by the Kahuna la'au lapa'au, or herbal doctor.¹²⁷

Kāne and Kanaloa

According to mythology, the god of natural phenomena, Kāne, is paired with the Kanaloa, the squid god.¹²⁸ Both Kāne and Kanaloa have an association with the fishpond, water and 'awa. In Hawaiian mythology Kāne and Kanaloa were the water finders. They created the streams that flowed into " Waihee, Kahakuloa, and at Waikane on Lanai, Punakou on Molokai, and Kawaihoa on Oahu."¹²⁹ The story of Kāne and Kanaloa found its way to 'awa drinkers because water was needed to make an 'awa beverage. Here is excerpt from Beckwith's *Hawaiian Mythology* explaining the association with 'awa and Kāne and Kanaloa:

" 'Awa-iku' are said to be beneficent spirits that act as messengers for Kane to ward off the evil influences of the 'mu' spirits and manage the winds, rains, and other things useful to man. An old hula song danced today alludes to this awa-drinking propensity of the god:

Ua maona a Kane i ka awa,
Ua kau ke kaha i ka uluna,
Ke hiolani a la i ka moena,
Kipu i ke kapa a ka noe.

'Kane has drunk awa,
He has placed his head on a pillow
And fallen asleep on a mat,

¹²⁶ Martha, *Hawaiian Mythology*, pg 32-33.

¹²⁷ June Gutmanis, *Na Pule Kahiko, Ancient Hawaiian Prayers*, (Honolulu: Editions Limited Publisher, 1983), pg. 163.

¹²⁸ Martha, *Hawaiian Mythology*, pg. 60.

¹²⁹ Martha, *Hawaiian Mythology*, pg. 64.

Wrapped in a blanket if mist' ."¹³⁰

Kāne and Kanaloa as a pair are associated with 'awa, the seasons and the movement of the sun from rising to setting. They are also associated with water in a couple of ways. Kāne can alternatively represent fresh water, influencing the procreation of fish in streams and Kanaloa, which can alternatively represent the ocean and the 'aumakua, or family god of the octopus or squid. Additionally, together they are associated with canoes, with Kāne as the builder and Kanaloa as the sailor. In singular manifestations, Kāne is associated with sunlight, sunrise, east, bamboo, taro, sugarcane, coral, wauke and popolo. Kanaloa is associated with the rain, ocean, wind and bananas.¹³¹

Reflection

Hawaiians constantly observed the natural life forces, for it was crucial in subsistent living. Overtime, these natural life forces were worshipped as deities and were honored through offerings and prayer. Heiaus were constructed for the purpose of tapping into these life forces. The next section focuses on the form and function of these types of heiau that were situated to draw into different entities.

Studying these major deities provides insight to the Hawaiian people and practices. The types of plants that represented these deities are valuable in understanding the importance of their presence in rituals.

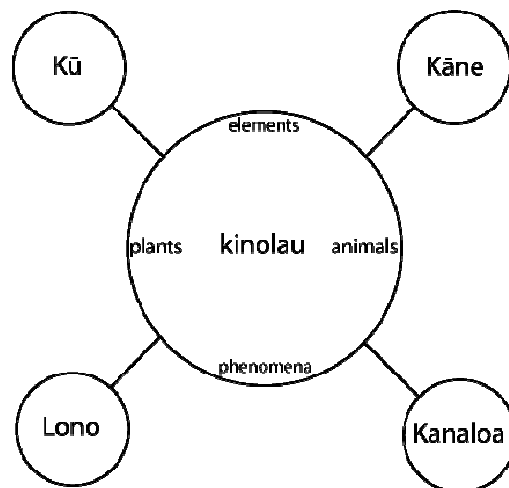


Figure 64. Diagram of the four major Hawaiian deities outside the physical realm. Created by the author.

¹³⁰ Martha, *Hawaiian Mythology*, pg. 63-64.

¹³¹ Ibid 126.

3.6 Heiau: Form, Function , spatial elements and organization

Observation of the universe also acquired channeling these phenomena by erecting temples or heiaus. Hawaiian chiefs would consecrate a desired site through the guide of a kahuna kuhikuhi pu'uone on which to build a heiau. Sometimes an old heiau would be renovated due to its spatial importance or if a sense of mana was present. A heiau was a connection between Hawaiians and the gods and also with nature. This section focuses on the form, function and spatial organization of a heiau as it relates to alignments especially when connecting with the cosmos.

The word Heiau is two words. "Hei" is a root term which translates to snare and "au" is translated as current. When put together, it means to ensnare currents, energy forms or mana. A chief, or Ali'i, would offer prayer to many deities he wished to receive energy from. The two major types of heiaus that were erected for the dieties Kū and Lono, were the luakini and the māpele.

The Ali'i Nui, high chief, was concerned with two rituals that related to the building of the heiau for worshipping the idol gods Kū and Lono. The Kū ritual was strict and required a high ranking priest. If the Ali'i Nui desired to worship Kū, then a luakini was built. The luakini was considered a war temple for the Ali'i Nui and he would ask for guidance from Kū and awaited the acceptance of the 'aha (cord carried by a priest). If the 'aha was accepted, it was a sign that the Ali'i Nui would be victorious and he would embark with the war. If the opposite happened, where the 'aha was not accepted, this meant the Ali'i Nui would be defeated in the war; his actions would be not to go to war with another Ali'I Nui. Law breakers, held captive, were sacrificed at the luakini heiau.¹³²

The main spatial elements of a luakini consists of a oracle tower, carved wooden images, an altar, a drum house, a waiea house, an oven house and the mana house. These elements were constructed out of Kū's kinolau, the 'ohia'a lehua or hard wood tree.¹³³ The organization of the elements and the luakini itself was oriented on an axis making it possible to be in alignment with the rising and setting of the sun.

¹³² David Malo, *Ka Mo'olelo Hawai'i*, translated by Malcolm Nāea Chun, First People's Productions, 2006, pg. 121-125 (English Translation).

¹³³ John Papa I'i, translated by Mary Kawena Pukui. *Fragments of Hawaiian History*. pg. 34.

If the Ali'i decided to worship Lono, the māpele was built. The māpele and its rituals for Lono was flexible and the priest that was present was usually from a lower rank. The function of the māpele was to offer pigs to Lono in hopes for increased food, crops, rain and abundance; no human sacrifice happens in a māpele.

Both of these types of heiaus came with strict prohibitions, or kapu. It is important to note that a luakini was only built by the Ali'i Nui; the māpele can be built by both Ali'i and Ali'i Nui. Male chiefs were not the only ones to build heiaus, females chiefs could also construct a heiau. The Waihou hale o Papa belonged to a female chief and functioned for the good of children and women for the benefit of the 'āina.

Apart from the luakini, there is a much more passive type of heiau that was built for healing, the lapa'au heiau. The lapa'au housed many medicinal plants and herbs around the site. Some contemporary Hawaiian spiritual healers frequented one of these type of heiaus, named Keaiwa to practice their ancient knowledge of healing.¹³⁴ There is also a heiau devoted for increasing food supply and one that was designed to promote rain. Heiau shrines that were for the family and for fishermen and farmers were of the smaller variety.

Hawaiian commoners too, built heiaus in the agricultural category. A heiau ipu-o-Lono is an agriculture heiau that is often seen near sites of crop production for the purpose of crop and plant abundance. Another is the heiau ko'a, a shrine consisting of piles of coral or stone placed in a circular fashion, built near sources of fish such as ponds, streams and oceans. This heiau brought abundance in fish production. Further yet, other heiaus were concerned in the function of increasing rain, as in the case of the heiau ho'oulu ua.¹³⁵

¹³⁴ Van James, *Ancient Sites of Oahu: A guide to Hawaiian Archaeological Places of Interest*, (Honolulu, Hawaii, Bishop Museum Press: 1991), introduction pg.9.

¹³⁵ Samuel M. Kamakau, *The Works of the People of Old*, (Honolulu: Bernice Pauahi Bishop Museum, 1976), pg. 132-133.

The first heiau was built in Nuʻuanu at a place called Waolani. It was said that Wākea lived there. This was the earliest design style of a heiau during the Wākea period. A description of this type of heiau was given by the people of old:¹³⁶

O Wakea la ko Waolani,	Wakea belonged to Waolani
O Kukalepe la i Waolani,	Kukalepe was at Waolani
Ka paehumu la i Waolani,	The tabu enclosure was at Waolani
Ka ʻiliʻili la i WAolani,	The pebbled area was at Waolani
Ka ʻanuʻu la i Waolani,	The ʻanuʻu tower was at Waolani
Ka mana la i Waolani,	The mana house was at Waolani
Ka hale pahu la i Waol,ani	The drum house was at Waolani
Ka moʻi la i Waolani,	The main image was at Waolani
Ke kuapala la i Waolani.	The offering stand was at Waolani

In building a heiau, a foundation was built first, then a stone wall to surround it. Typically, seven terraces, or kipapa, were made at the top. If a house was in the vicinity of the heiau it was paved with pebbles.

Orientation of a heiau was also very important. In the interview with Shad Kane referenced earlier, he mentioned that a heiau that once stood on Puʻu o Kapolei was oriented to pin point the movement of the sun and important celestial events. The alignment of the heiau was mauka to makai orientation, showing importance of the relationship between the sky, land and sea. This served as an important reminder of the necessity of trading goods between those close to the mountain and those near the sea.¹³⁷

Reflection

The heiau spatial organization depended on the type of function intended. A luakini functioned for war and a māpele was for agriculture and abundance. These were the main programmatic functions that the Hawaiians used in times of needed abundance or spiritual guidance. The method of functions shows the values that have been used in ancient times as it relates to agriculture uses, materials of the heiaus, the kinolau and the geometric shape of the heiau itself.

¹³⁶ Samuel Kamakau, *The Works of the People of old*, 135.

¹³⁷ Shad Kane interview.

3.6.1 Kāhuna Kuhikuhipuʻuone (Priest Geomancer)

Heiaus were not placed arbitrarily. Sites were selected based on protocols or events that proved the site was sacred. The Kāhuna Kuhikuhipuʻone was the type of master that observed and determined the correct placement of a heiau. These kahunas specialized in the science of observing the celestial environment, the surrounding landscape and contributed in determining the correct site location for erecting a heiau for the Aliʻi.

Sacred places or wahi pana, were an important aspect of spirituality because there was *mana*, or spiritual power that was present.¹³⁸ In the introduction of the book *Ancient Sites of Oahu: A guide to Hawaiian Archaeological Places of Interest*, Edward Kanahele mentions that gods define *wahi pana* as well as certain individuals.¹³⁹ Kanahele was referring to the land experts or the Kuhikuhipuʻone. They knew well the nature of the land, the soil and what type of plants grew best with them. They could determine whether planting would be productive and knew if there were any water sources near the site. They were the ones who had the foresight to which site is best to build the heiau¹⁴⁰ and were instrumental in planning a heiau from open site to finished construction.¹⁴¹

If a luakini was to be newly built, the Kuhikuhipuʻuone advised a design on the sands. Attention would be paid to the model and structure of heiaus from a previous Aliʻi. They were taught to use the sand as a modeling element so they could familiarize themselves with all terrain and heiau types. The Kuhikuhipuʻuone would then direct a certain heiau model that was displayed on the sand dunes for the Aliʻi to observe and give consent to the placement of the elements.

¹³⁸ Van James, *Ancient Sites of Oahu: A guide to Hawaiian Archaeological Places of Interest*, (Honolulu, Hawaii, Bishop Museum Press: 1991), introduction pg.x.

¹³⁹ Van James, *Ancient Sites of Oʻahu*,

¹⁴⁰ Martha, *Kepelino's*, (Hawaii: Bishop Museum) 134.

¹⁴¹ Andrew C. Yanoviak, *Pōhaku: The Art & Architecture of Stonework in Hawaiʻi*, (Honolulu, Hawaii: Editions Limited, 2003), pg. 1)

Reflection

The importance of choosing a site based on physical features of the land is similar to Chinese geomancy as explained in chapter one and of the placement of Moai structures of Rapa Nui in chapter two. The value taken from this lesson is the importance of site selection based on physical features of the land where solar and celestial phenomena can be observed and marked, implementing that the area is important.

Interpretive Knowledge

Chapter 4 Research and Design : The Civic Space Case Studies

As was explained at the introduction of this research project, a civic space is an extension of a community. In historical context, a Hawaiian cultural landscape itself may be called a civic space because it is an extension of the Hawaiian culture and community. What is the importance of a space? Does it matter if it was sacred or not? How about the use and purpose ? And what actually happens at a civic space? The following contemporary civic spaces answer these questions through a series of studies on how each design was based on layers of alignments, culture and specific themes that nurtured the success of the designs.

4.1 Uluru Kata-Tjuta Cultural Centre



Figure 65. Uluru Kata-Tjuta Cultural Centre. source:
<<http://www.convictcreations.com/culture/australianculture.htm>>

Background

The inhabitants of the area of the Uluru Kata-Tjuta Cultural Centre are the Anangu, indigenous to Australia. They are a spiritual group of people that value their surroundings, especially that of the two most notable rock mountain formations Uluru (Figure 66) and Kata Tjuta (Figure 68) at the heart of Australia's Red Centre. Both Uluru (Ayers Rock) and Kata Tjuta (Mount Olgas) have creation stories that involve the Aboriginal "dreamtime".



Figure 66. Uluru Mountain as seen from satellite imagery. source: <http://en.wikipedia.org/wiki/Ulu%E1%B9%9Fu-Kata_Tju%E1%B9%AFa_National_Park>



Figure 67. Creation stories painted on Uluru. source: <<http://wonderingfair.com/2010/11/03/tjukurpa-versus-the-tourist/>>



Figure 68. Kata-Tjuta Aerial View. source: <http://en.wikipedia.org/wiki/Kata_Tjuta>

Tourism

Uluru (figure 66) is iconic in Australia's tourism industry having an estimated 400,000 visitors annually.¹⁴² There is controversy of the tourism visitation, as they tend to climb Uluru, which is very sacred to the Anangu people, who strongly discourage the actions of climbing. There is a cultural clash at the site as it has both settlers and Aboriginal tribes. The Anangu Aboriginal tribe views Uluru as a sacred site that has a strong symbolism in their culture. The non-indigenous groups and tourists, see Uluru as a national landmark of Australia for which creates the notion of exploring the "wild".¹⁴³

Before 1940, Uluru has not been internationally recognized as a site for the Aboriginal people, it was more of a prized symbol for the European settlers. Tourism has increased and since then, poor management of the area caused unsightly ad hoc structures built for tourists near the national site.¹⁴⁴ In 1976, in the area north of the national park, a newly developed tourist village, called Yulara was built by the Northern Territory Government. The action was in part to discourage Aboriginal presence and activity within the area. The Whitlam Government, who were governing the National Park at the time, proposed a Commonwealth management system which in 1975, established the

¹⁴² James Sarah, "Constructing the Climb: Visitor Decision-making at Uluru," *Geographical Research*, Vol. 45, Issue 4(December 2007): pg. 398-407, accessed May 6, 2015, doi: 10.1111/j.1745- 5871.2007.00478.x, pg. 298.

¹⁴³ James Sarah, "Constructing the Climb: Visitor Decision-making at Uluru," pg. 400.

¹⁴⁴ Jillian Walliss, "From Bus Drive Dreaming to Tjukurpa - the Uluru-Kata Tjuta Cultural Centre," From the Charles Darwin University website (learnline.cdu.edu.au), accessed May 6, 2015, <http://learnline.cdu.edu.au/tourism/uluru/downloads/From_Bus.pdf>, pg. 163.

Commonwealth Australian National Parks and Wildlife Services (ANPWS). The ANPWS held power and control over the National Park.¹⁴⁵

The Anangu people still felt marginalized, until the election of the Hawke Government, who in 1983 created a joint management agreement between the Anangu and the ANPWS. In 1985, after the animosity between the Northern Territory and Commonwealth over the rights of these Aboriginal lands, the Uluru - Kata Tjuta Aboriginal Land Trust was created. This trust was for a 99 year lease and thereafter was to be returned to the ANPWS. In a political sense, this gave the Anangu people the right to claim their land again.¹⁴⁶ In 1995, to commemorate the 10 year anniversary of the Anangu people reclaiming the title of the Uluru-Kata Tjuta National Park, the Uluru Kata-Tjuta Cultural Centre was opened after a 5 year process.¹⁴⁷

Design

Uluru Kata-Tjuta Cultural Centre is designed by architect, Gregory Burgess. It was not an easy task. It took much collaboration with the Anangu tribe and acquiring their trust meant living with them for long periods of time. It was important that the Cultural Centre be managed by the Anangu people and to reestablish their cultural practice and "dreamtime" rituals. Burgess used the color of the surrounding landscape, the red sand, to blend with the blood colored wood and copper roof. The form of the building portrays the undulating layers between the culture of the Anangu people, the tourists and the landscape.

The form of the building itself was derived from the Aboriginal traditional story of Tjukurpa. Tjukurpa is the creation story of Liru and Kuniya, both snake creatures, whose battle occurred on the site that the Cultural Centre sits on. There are rock paintings and reliefs on the surfaces of Uluru that tell the story of the deadly fight between Liru and Kuniya. It was said by Burgess that the shape was inspired by seeing a group of Anangu women recreating the mythological stories of the snake. More importantly, the site was

¹⁴⁵ Jillian Walliss, "From Bus Drive Dreaming to Tjukurpa - the Uluru-Kata Tjuta Cultural Centre," pg. 165.

¹⁴⁶ Jillian Walliss, "From Bus Drive Dreaming to Tjukurpa - the Uluru-Kata Tjuta Cultural Centre," pg. 166.

¹⁴⁷ Samia Rab, edited by Sarah Menin, "Rooted Modernity: Reconstructing Memory in Architecture," *Constructing Place: Mind and Matter* (2003): pg. 269.

chosen by the Anangu people themselves. Choosing the site where the Centre is was based on the Anangu law (*Tjukurpa*). There used to be a great big oak that once stood there and it was symbolic to the Liru clan warriors who came from the west and their witnessing of the battle between Liru, the poisonous snake and Kuniya, the carpet snake.¹⁴⁸

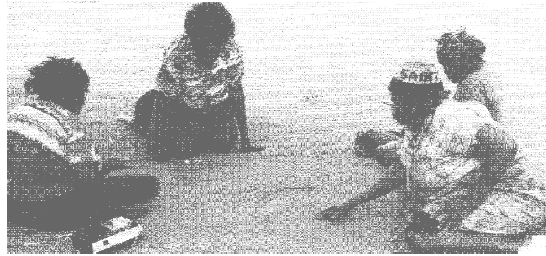


Figure 69. Anangu people recreating the story of Liru and Kuniya. This served the inspiration for the building form.¹⁴⁹

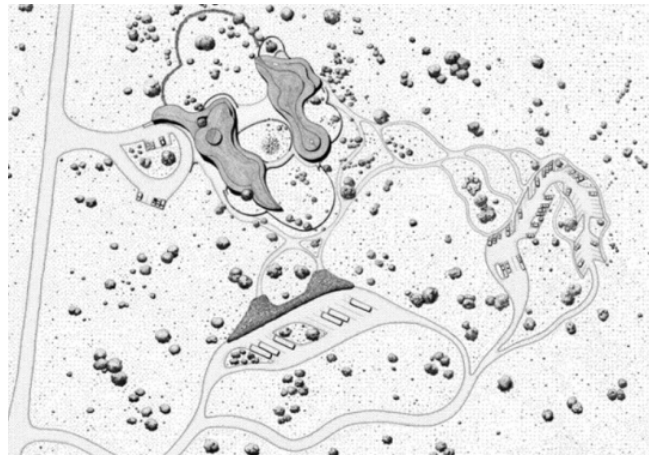


Figure 70. Uluru Kata-Tjuta Cultural Centre site plan. source: <<http://www.gbarch.com.au/>>

¹⁴⁸ Peter Herrle and Erik Wegerhoff, *Architecture and Identity*, (UK: Transaction Publishers, 2008), pg. 416.

¹⁴⁹ Sarah Menin, *Constructing Place: Mind and Matter*, (USA: Routledge, 2003), pg. 2.

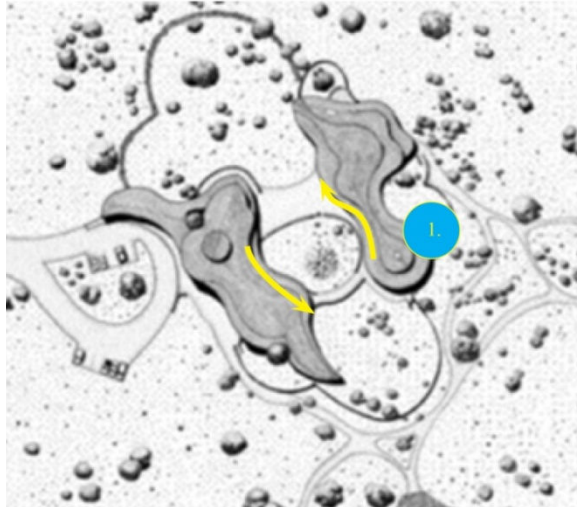


Figure 71. Site Plan .Author rendering using adobe indesign and image from website: <http://www.gbarch.com.au/>

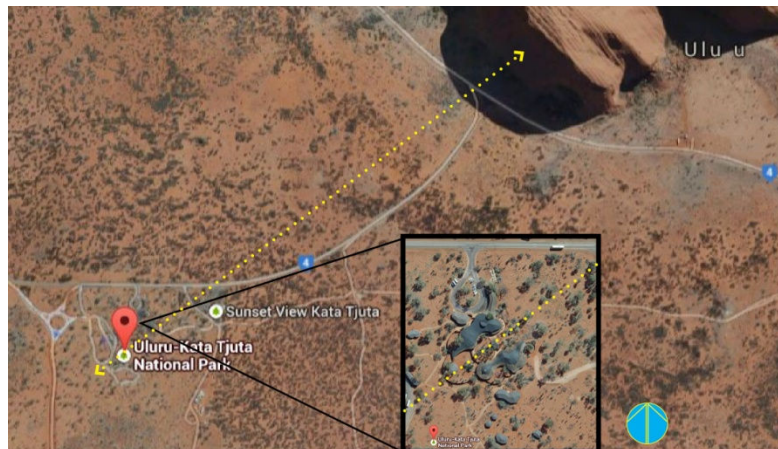


Figure 72. Uluru and the Cultural Center are oriented along the yellow axis. Author rendering using Adobe Indesign and Google maps.

Activities and Programs

The Cultural Centre has a complete variety of programs. The main vision for the Cultural Centre is to have visitors to encompass and learn about the natural and indigenous cultures of the area. Maintaining knowledge of the country is part of the maintenance and conservation of the Anangu history and their traditional knowledge in hopes to understand the landscape in the present and future. There are tour guides within the area as well. Walking tracks were made so that visitors can view Uluru from a distance with respect. There are also view areas that direct the user to experience the

beauty of the sunrise and the sunset and how it interacts with the red of the hill, making for a perfect picture moment.¹⁵⁰

For visitors, it is suggested to start at the Cultural Centre to get the full information about the inhabitants and the landscape through activities and experiences to help understand the Anangu tribe. The next step is to follow the walks and pathways that lead to key landscape features, displaying natural ecosystems. This is used to discover diverse animals, geological and plants within the area.¹⁵¹

Conclusion and lessons learned

Uluru Kata-Tjutu Cultural Centre is designed based on many cultural aspects of the Anangu tribe's inhabitants, daily life and beliefs. The physical landmarks of the area are the two hills Uluru and Kata-Tjuta and are very sacred to the Anangu tribe. Violation of the sacredness occurs when tourists climb on these landmarks. In terms of design, the centre itself and the materials of the building are represented by the surrounding physical landscape. The site placement of the Cultural Centre is based on the Anangu Law, Tjukurpa creation story and there is a great oak which is represented this mythical story. Symbolically, the forms of the building are reminiscent of the famous battle as told in the Anangu creation stories. The forms aligned towards Uluru to signify the importance of the rock.

The area of the cultural centre takes full advantage of the natural landscapes of the area. Activities within the Cultural Centre help visitors get educated before embarking

¹⁵⁰ Uluru-Kata Tjuta National Park, *Knowledge Handbook*, Australian Government Director of National Parks, June 2012.
<<https://www.environment.gov.au/system/files/resources/d97e9851-014c-4bd0-96c8-9b05c59da72a/files/handbook.pdf>>

¹⁵¹ Uluru-Kata Tjuta National Park, *Knowledge Handbook*, Australian Government Director of National Parks, June 2012.
<<https://www.environment.gov.au/system/files/resources/d97e9851-014c-4bd0-96c8-9b05c59da72a/files/handbook.pdf>>

out on the path ways. These pathways lead users to experience key vistas of the landscape, especially looking towards Uluru.



Figure 73. Interior of the Cultural Centre with wooden oak post. < <http://www.uncubemagazine.com>>

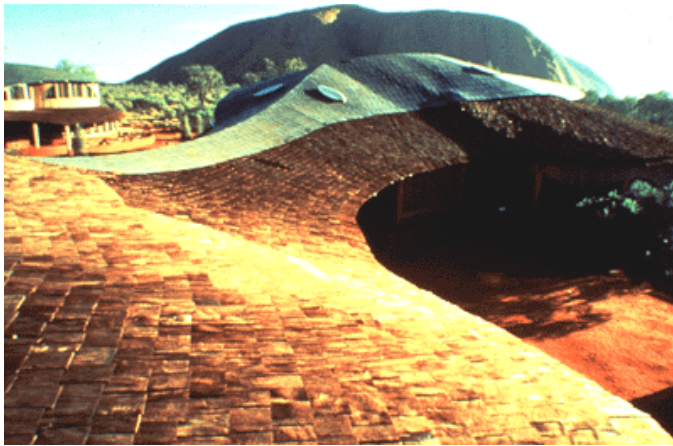


Figure 74. Roof shingles with material palette of copper and bloodwood timber.
<<http://modernindigenousarchitecture.blogspot.com/p/northern-territory.html>>

The lessoned learned from this case study are the importance of landmarks to the Anangu tribe and the hills of Uluru and Tjuta. These hills also have creation stories incorporated within and the stories come alive within the form and shape of the architecture and spatial landscape. The colors of the landscape influence the selection of the color and texture of the design. The Pathways are ADA accessible and are circulated so that emergency vehicles can access hard to reach areas.

This being a civic space, it extends into the surrounding landscape and connects the Anangu tribe. The importance of this civic space is its purpose as an educational center for tourists and locals alike. Being that this cultural centre is in the area, it is managed by the Anangu people and its community. Maintaining the sacredness of both Uluru and Tjuta is an important goal so measures like creating pathways prevent tourists

from climbing the hill. Information on how to react and respond to the Anangu tribe and their culture is also considered an important educational tool for tourists and the cultural centre has such information.¹⁵²

¹⁵² Uluru-Kata Tjuta National Park, *Knowledge Handbook*, Australian Government Director of National Parks, June 2012.
<<https://www.environment.gov.au/system/files/resources/d97e9851-014c-4bd0-96c8-9b05c59da72a/files/handbook.pdf> >

4.2 Fale Pasifika at University of Auckland (Jasmax Architects)



Figure 75. The central Fale of the Fale Pasifika Complex Pacific Island Studies. source: <http://architecturenz.net/Find-an-Architect-Project-Detail/Fale-Pasifika-i40257500-076c-4aff-bfeb-a11e12f5d71c-1115.htm> >

Background

Fale Pasifika is a communal group of buildings that was built for the Pacific Island Studies at the University of Auckland, New Zealand. In the middle of the complex is a fale based off of the traditional Samoan style. New Zealand based architecture firm Jasmax Architects, designed the fale with the guidance of University of Auckland Art and Design faculty member, Albert Refiti, who specializes in spatial exposition in Samoan architecture. The fale is an iconic building in the Pacific, especially in New Zealand.¹⁵³ As the fale being at the center of civic activities, it serves as a multi-functional program fostering creativity between local artists and the community. The surrounding complex functions as both a learning and living environment, which is typical in the layout of Samoan communal spaces.

Design

The prominent form of the Fale is based off of the traditional Fale Afolau or Samoan Long guest house. Traditionally the Fale Afolau is one of two prestige structures (the other being the *Fale Tele*) that were built for the village chiefs.¹⁵⁴ *Folau* in the title

¹⁵³ Albert Refiti, "Albert Refiti - Architect and Academic," video. 4:12, accessed May, 6, 2015. https://cdn.auckland.ac.nz/assets/central/about/pacific-at-the-university/video/01_Intro-Albert-v2_x264.mp4

¹⁵⁴ Fepulea'i M. Van der Ryn, *The Measina of Architecture in Samoa - An Examination of the VĀ in Samoan Architecture and Socio-Culture Implications of Architectural Changes*, The Institute of Samoan Studies National University of Samoa, 2007, pg 5.

Fale Afolau means voyage and it relates to the building as being a storage for long canoes.

Another important aspect of Samoan architecture is the concept of Tā and Vā. Refiti describes this theory as "...a productive concept that unifies three things: nature, mind and reality in a process of becoming, where all things...stand in a process of eternal exchange relations and cycle...Central to this process of eternal exchange is the role that time and space play, as mutual attractors and repellents enabling a continual dance of change in which 'all things, in nature, mind and society, stand in eternal process of relations of cycle and exchange, giving rise to conflict or order..."¹⁵⁵

Fepulea'i Micah Van der Ryn explained that Vā is a "...space of social relations that bind and produce the cohesiveness of Samoan Community...it is a Samoan concept that connects the tangible and intangible aspects of Samoan culture, principally the architecture, and a system of social relations into a single cultural order..."¹⁵⁶

In the unpublished paper by Fepulea'i Micah Van der Ryn, from the Measina a Samoa Conference in December of 2005, he explained that there are nine common characteristics of Traditional Samoan architecture:

- 1) The central space has an open round ceremonial ground, or *Malae*
- 2) Village guest houses and their placement of the main facade should face towards the *Malae*

¹⁵⁵ Albert Refiti, "How the Tā-Vā Theory of Reality Constructs a Spatial Exposition of Samoan Architecture," *Heretic Papers on Pacific Thought: alrx01-2013*, Department of Spatial Design, Auckland Univ. of Technology, accessed March 13, 2015, <https://www.academia.edu/3570169/How_the_Ta_-_Va_theory_of_reality_constructs_a_spatial_exposition_of_Samoan_architecture>

¹⁵⁶ Fepulea'i M. Van der Ryn, *The Measina of Architecture in Samoa - An Examination of the Vā in Samoan Architecture and Socio-Culture Implications of Architectural Changes*, accessed May 5, 2015 (The Institute of Samoan Studies National University of Samoa, 2007), <https://www.academia.edu/7067772/The_Measina_of_Architecture_in_Samoa_An_Examination_of_the_Va_in_Samoan_Architecture_and_Socio-Cultural_Implications_of_Architectural_Changes> pg 1.

- 3) Openness with no walls - Traditionally, Samoan architectural structures are open to the outside world, allowing transparency and has its advantages in political settings where one can see all actions of their surroundings.
- 4) One room under one roof - creates openness and allows the intermingling between inside and outside.
- 5) Rounded Ends - A distinct and important feature in Samoan and Tongan architecture allows increased visibility during council meetings.
- 6) Multiple ranked structures within household compounds - In Samoan layout of spaces, there are multiple ranked structures, meaning many functions under one roof.
- 7) Social and symbolic significances of house posts - Posts within the fale signify political and social power and dictates seating arrangements.
- 8) Front/rear orientations - Subservient groups sat at the rear while higher-rank people sat at the front.
- 9) Flexible use of household spaces - Samoan space has many occurring activities within a single space.



Figure 76. Fale Pasifika using prefabricated gluelam frames. <<http://www.mcintosh.co.nz/CASE+STUDIES/Fale+Pasifika.html> >



Figure 77. Interior of the Fale Pasifika. source: <<http://www.nzwood.co.nz/learning-centre/engineered-timber-fale-pasifika/>>

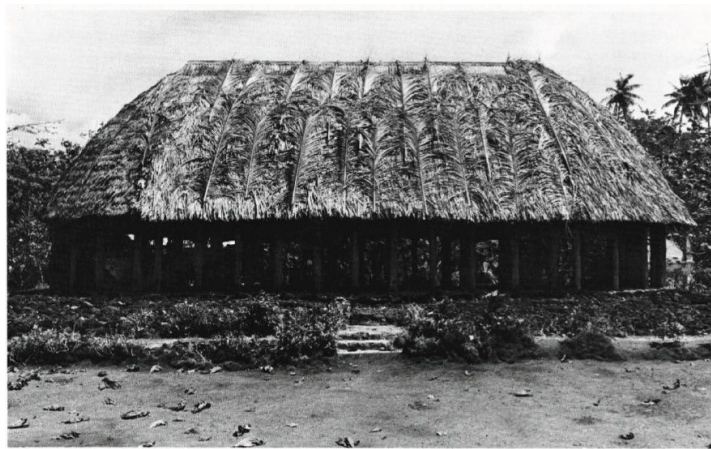


Figure 78. Samoan *Fale Afolau*, or communal longhouses. source: <<http://village.1samoana.com/profiles/blogs/samoan-history-the-ways-of-our-ancestors>>



Figure 79. Pictures of the Fale Pasifika.¹⁵⁷

¹⁵⁷ source: <<http://architecturenz.net/Find-an-Architect-Project-Detail/Fale-Pasifika-i40257500-076c-4aff-bfeb-a11e12f5d71c-1115.htm>>

In analyzing the Fale Pasifika complex, the design symbolically portrays the shape of the roof of a traditional style Samoan fale. Its roof is manufactured fiberglass allowing the curvature form. The interior of the space being open, allows for maximum air penetration. It also creates a space for multi-functional purposes.

Activities and Program

The Fale Pasifika is an iconic building complex in the University of Auckland serving as a central communal space for the Pacific community. It functions well as a civic space and conceptually follows the traditions of a Samoan fale with its openness and multi-functional usages. But more importantly, the fale is culturally represented as having both an tangible and intangible aspect of the representation of the Samoan way of life.

The surrounding buildings around the Fale Pasifika are administrative buildings, and art galleries which is connected by the malae. The malae, which is the paved open space in the center of the cluster of buildings, is a transitional space. This is reminiscent of the marae *Taputapu-atea* of New Zealand as explained in chapter 2.

Conclusion and lessons learned

The values taken from this case study are the importance of a communal space that is both flexible and welcomes the community through the openness of the fale. It's flexibility of having multiple usages contribute to the connection between community and the University of Auckland. Although the materials are different, the roof of the Fale Pasifika has a strong symbolic reference to the traditional fale.

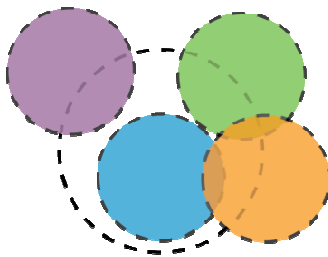


Figure 80. Diagram depicting multi-spatial function of a Samoan fale. The white circle represents the fale, while the colors represents activities.

4.3 Kūkaniloko Heiau (Oahu)

Kūkaniloko Heiau, the Birth Stones of Central Oahu



Figure 81. Kūkaniloko site located in Central Oahu. < http://www.alex-aroundtheworld.com/Hawaii/html/oahu_2.html > Aerial view of the site. source: < <https://www.youtube.com/watch?v=qK1yyfjqU0I> >

Background

In the center of Oahu sits an important heiau, Kūkaniloko meaning sounds within.¹⁵⁸ This heiau is situated in the Helemano plain, opposite Whitmore village. The significance of this heiau is its history as being a place where new born chiefs were witnessed by thirty-six nobles present. There was also a significance in solstice orientation, as retired United States army major Harry G. Kurth and later Rubellite Johnson, claimed during research of this area in 1982.

In the year of 1982, Kurth observed the sun rays through the Kolekole Pass of the Wai'anae mountain range during the winter solstice while situating himself within the vicinity of the temple. At the site, he found what to be a diamond shape rock that was reminiscent of the Gilbertese "stone boat" formation, a Micronesian navigational star compass.¹⁵⁹ Kurth would name this stone the "Kane-Lono Stone". The Kane-Lono stone is aligned in accordance to the cardinal axis points and like the Gilbertese with 36 stones, it is not a coincidence that thirty-six chiefs were needed to witness the royal birth of a new chief. According to Kurth and Johnson, notches in the stone suggest alignments

¹⁵⁸ Rubellite Johnson, *Kaho'olawe's Potential Astro-Archaeological Resources*, pg 81.

¹⁵⁹ Ibid 82.

towards the solstices of winter, equinox and summer. Below is the view looking towards the Waianae mountain range, from Kūkaniloko during the solstices' and equinoxes.¹⁶⁰

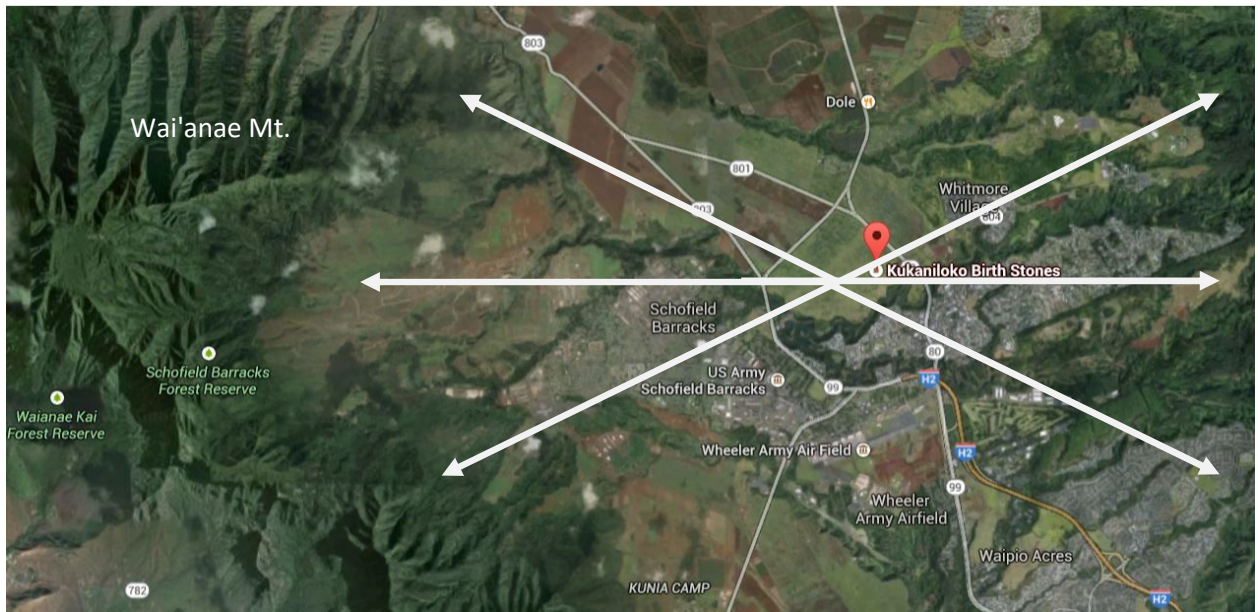


Figure 82. Kūkaniloko and views towards summer solstice (top), equinoxes(middle) and winter solstice (bottom). Google map.



Figure 83. View towards the Wai'anae mountains and the setting of the sun during its solstices and equinox. Google Images.

Design + Activities + Program

This "Kane-Lono" stone that Kurth referred to, is the piko of Oahu. In an online video, Tom Lenchanko, the caretaker of Kūkaniloko have said this pohaku, or stone, was and still is the center of the islands. The stone functioned as a compass, noting north, east, south and west as well as a star compass with its 36 serrations. According to Lenchanko, Kūkaniloko was built between 1200 to 1300 A.D., during the rule of Mā'ilikūkahi. Mā'ilikūkahi was one of the greatest rulers of Oahu, and was in fact, also born at this site. It became the center of education and knowledge and taught thirteen disciplines, most of

¹⁶⁰ Ibid, 81.

which are still unknown. Lenchanko also said it was a place to teach navigation and there is evidence due to stones with serration marks that align with the setting and rising of certain stars. Aside from navigational teachings, Kūkaniloko was also a place for giving birth, hence the transition of Kūkaniloko.

Conclusion and lessons learned

The values taken from this case study is observing Kūkaniloko's many celestial alignments with the Pu'u on both the Ko'olau and Wai'anae mountain range. With their knowledge of their surroundings, Hawaiians would observe the best site to build their heiau. This particular site was perfect for Kūkaniloko, for it was the center of Oahu and the natural form of the landscape fit perfectly with the rising and setting of the solstices and equinoxes. This was the traditional way of how the Kuhikuhi pu'u one found a site.

Another lesson learned from this case study is the three points of alignments. The first point is the piko stone of Kūkaniloko, the second point is the Ko'olau and Wai'anae mountain range and the third point is the celestial bodies. These three points when connected makes a ley line and creates alignments in the case of Kūkaniloko.

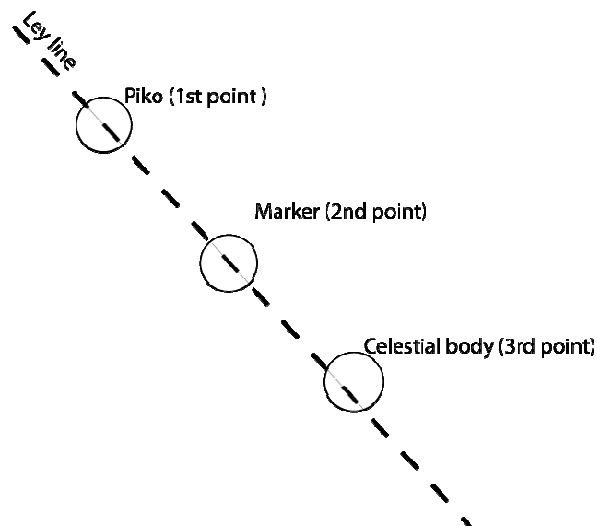


Figure 84. The three points which completes the alignment. Created by author.

Another observation is that Kūkaniloko was a birthing place for the Hawaiian royal families. In contrast, the location today is an area where tourists and locals frequent as a means to learn more about the ancient culture. Most importantly, Kūkaniloko is an

outdoor school of science that has many complex designs, as it relates to celestial alignments.

4.4 Forbidden City and the Chinese Olympic Stadium(China)

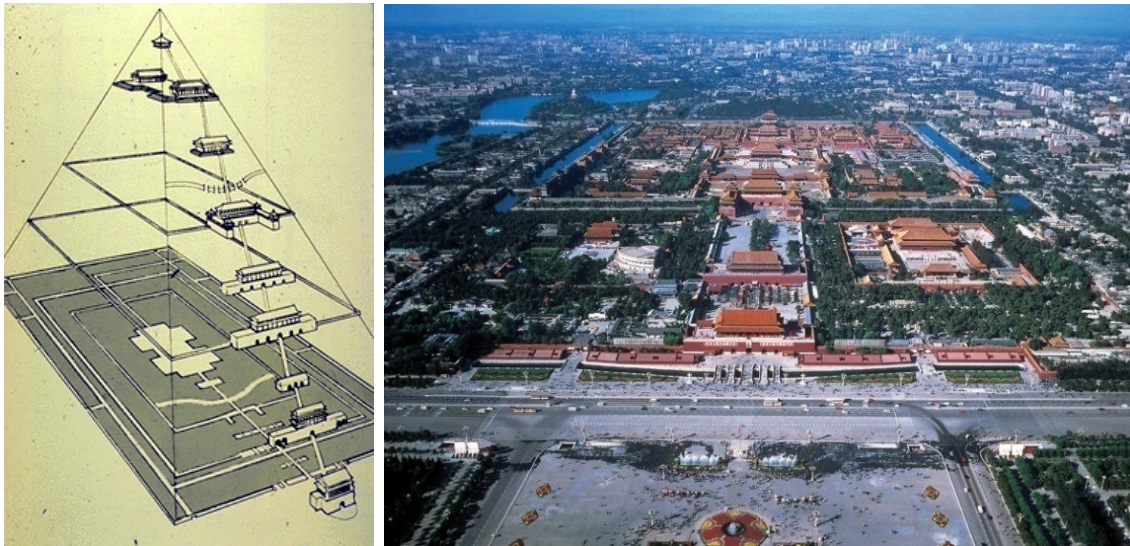


Figure 85. (left) Hierarchical importance of the Forbidden Palace, also a depiction of the *Axis Mundi*. <<http://archsoc.westphal.drexel.edu/New/ArcSocISA9.html>>. Aerial view of the palace, where the inner court is well hidden in the center < <http://www.wallallies.com/forbidden-city-aerial-view-2-hd-wallpaper/>>.

Background

During the height of the Forbidden City and Emperor rule, it was forbidden for citizens to enter this area, understandably gaining the name Forbidden City. At the time when designing of the city was developed, the layout of the palace was in relation to the cosmos. For example, the palace aligned with the northern pole star, establishing a central axis in which the four directions rotate around it.¹⁶¹ This concept is also referred to as *Axis Mundi*, where the cardinal points meet at a center and from this center is the connection between heaven and earth.¹⁶²

Design

Traditionally, rulers were oriented in the center based on the "Mandate of Heaven". This belief placed the rulers at the middle and made them oblige to pray towards the gods. It is the location and center of the earth is where the axis mundi emerged.¹⁶³ In the Forbidden City, the layout of the buildings was placed in a manner that the center of the palace, the inner court where the Emperor worked, was associated with the axis mundi. It was important that this inner court be secluded from public view.

¹⁶¹ Marja Sarvimaki, *Structure, Symbols and Meaning*, pg. 116.

¹⁶² *ibid*, 114.

¹⁶³ *ibid*, 114-115.

As explained in Chapter 1, the orientation of the city is based on feng shui principles. There was also an importance in the grid pattern as it related to Changan, the Chinese Tang dynasty capital. The grid pattern is fashioned on a north to south and east to west axis. There is a 150 meter wide central path that forms the main axial that penetrates the center of the Imperial City and the Imperial Palace (north) thus dividing the city east and west.¹⁶⁴ Numerology was also an important factor in the layout of the Forbidden City. According to Sarvimaki, the entire complex of the Forbidden City has 9999 rooms and the outer city has 9 gates.¹⁶⁵

The Olympic Green, the sports building complex built for the 2008 Beijing Olympics, is oriented along this axis. Interestingly, the Olympic Green was opened on August, 8, 2008 (8/08/08) at exactly 8:08 pm, as 8 is considered good luck in Chinese tradition.¹⁶⁶ There are many mixed reactions between the design layout in terms of it being aligned with an ancient monuments. Perhaps the Olympic Green is a contemporary Forbidden City, as you can see the similarities in the layout.

Activities + Program

Today, the Forbidden City is open to the public and is now called the Palace Museum. Back then, it was the opposite of a civic space, as it was forbidden for the citizens to enter and enjoy. Now, you could argue that the Palace Museum is a civic space, meant for all to utilize and captures the essence of traditional feng shui.

What has been learned from this case study is the cultural principles of Chinese cosmology, and the great importance in the layout and design of the Forbidden City. It defines that the Forbidden City once was the center. Today, the ancient monument has been foreshadowed by a contemporary space in the form of sports. Still, the cultural significance of alignments plays an important role for the Olympic Green.

¹⁶⁴ ibid, 50.

¹⁶⁵ ibid, 117.

¹⁶⁶ <http://www.feng-shui-tips-for-wealth.com/>



Figure 86. The alignment between the two civic spaces. Google maps and author's rendering using Indesign.



Figure 87. Diagram depicting alignments between the Olympic Green and the Palace. <<http://www.feng-shui-tips-for-wealth.com/>>

Chapter 4 Reflection

Chapter one, two and three mapped out examples and key concepts to prepare the reader to begin understanding the correlation between chapters and start to understand its application in real life case studies. The importance of usage of space, programs and everyday activities are connected in many ways to the cosmos.

The value of these case studies provide clues and information to what can be extracted and potentially used within the design of a Hawaiian civic space. The next chapter, chapter five, begins to include the concepts and ideas taken from the previous four chapters and applied in a holistic approach to begin seeing what a Hawaiian Civic Space should really be like.

Chapter 5: Design of a Hawaiian Civic Space: Pu'u o Kapolei

The proposed site is in Kapolei which is located in the 'Ewa area of Oahu in the Ahupua'a, or land division, of Honouliuli. The Kapolei development in the area is rapidly expanding, with developers and urban planners proposing master plans and transit oriented development. Some people have predicted Kapolei to become the second greatest city in Oahu after Waikiki. Kapolei, as well as other places within 'Ewa, has a rich ancient Hawaiian background.



Ahupua'a of 'Ewa

Figure 88. source: <https://kanakagenealogy.wordpress.com/tag/ahupuaa/>

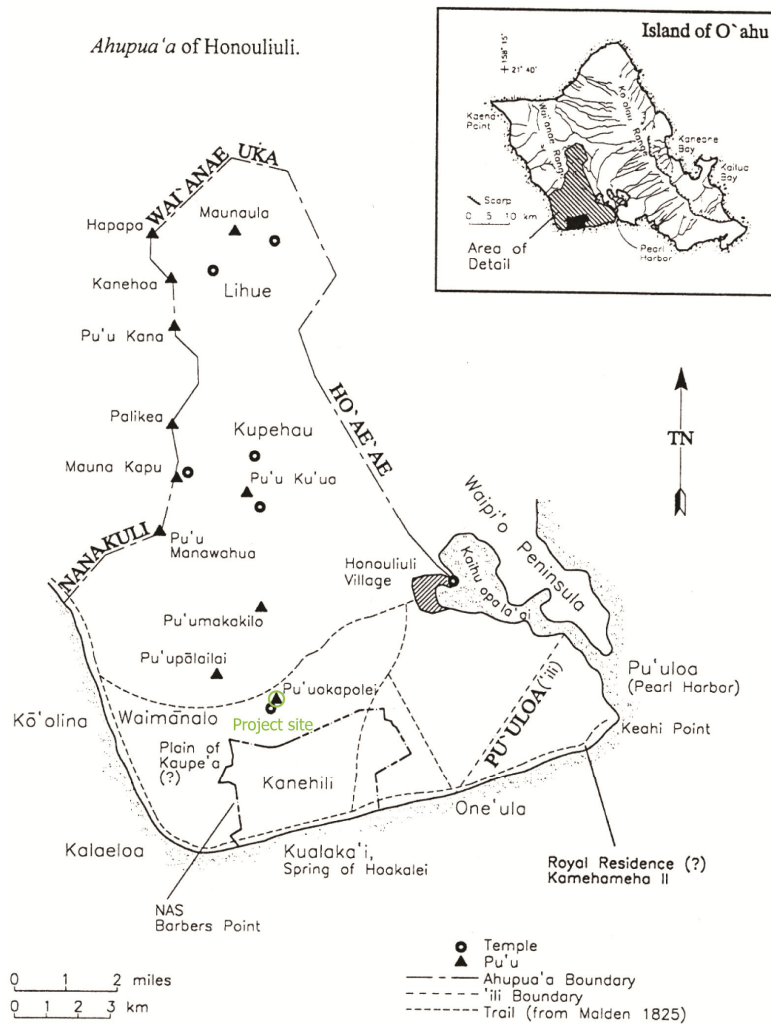


Figure 89. Ahupua'a Honouliuli and project site. source: Google images

5.1 Pu'u o Kapolei a rich history

Pu'u o Kapolei is located in Honouliuli. Pu'u means "Hill" and Kapolei means "beloved Kapo", which is referring to the Hawaiian goddess Kapo. The name Kapolei has a very special story attached to it. In Hawaiian mythology, Kapo was the elder sister of Pele, the fire goddess. Kapo had dual traits; She could be a benevolent hula goddess, or a goddess of sorcery. Kapo is the patron of the halau, or school of dance. Her form, or

kinolau, could be of the dracena tree or halapepe, which inspired the placement of hula stalks at hula altars.¹⁶⁷

Another deity that is connected with Pu'u o Kapolei is the Hawaiian pig god Kamapua'a. After Kamapua'a conquered the majority of Oahu, he relocated his grandmother, Kamaunuaniiho to Pu'u o Kapolei. It has been noted that Kamamaunaniho's houses' foundation and grave have been seen near the Pu'u in the early 1900s before being misplaced by developers.

5.1.1 Pu'u o Kapolei as an astronomical marker

There once was a heiau on Pu'u o Kapolei and was surveyed by McAllister after it had been destroyed.¹⁶⁸ Kane described this heiau as being the largest in the ahupua'a of Honouliuli, where it was dedicated to the sun.¹⁶⁹ It was also used as an astronomical marker as Kamakau described in *Na Hana a ka Po'e Kahiko: The Works of the People of Old* :

"...the Oahu people who reckoned the time called the season Kau for the setting of the sun from Pu'u o Kapolei, a hill in Honouliuli, 'Ewa, to the opening of Mahinaona. When the sun moved south from Pu'u o Kapolei - and during the season of the sun in the south - for the coming of coolness and for the sprouting of new buds on growing things - the season was called Ho'oilu."¹⁷⁰

¹⁶⁷ Kapolei's Storied Name. "Kapolei: The City Comes to Life.", Honolulu, *Trade Publishing Company*. October 1995. pg. 32.

¹⁶⁸ J.G. McAllister, *Archaeology of O'ahu*, Honolulu : Bishop Museum, , pg. 108.

¹⁶⁹ Shad Kane, interviewed by the author.

¹⁷⁰ Samuel Kamakau, *Na Hana a ka Po'e Kahiko: The Works of the People of Old*, Honolulu, Hawai'i: Bishop Museum Press, 1976, pg. 14.

5.2 Physical and Climatic characteristics

The majority of the geographic characteristic of Oahu is of volcanic matter. In the 'Ewa district, towards mauka, is older alluvium or clay deposits, soil that is fertile enough for growing crops. The topography is steep with uneven hills surrounding the area. Towards the makai section is calcareous or limestone reef rock. The area is mostly coastal plains consisting of coral reef which lays flat towards the sea. Parts of the 'Ewa region and those of Kalaeloa have dissolved limestones, or karst, dispersed throughout the plains. At some spots within the ahupua'a of Honouliuli, there are areas of vent deposits from lava flows.

The 'Ewa side of the island is known for its arid and hot weather, only having on average 17.9 inch of rain annually.¹⁷¹ The average annual high temperature is 84°F and the average low is 67.6°F. The hottest months of the year are June through September, with November through February/March being the coolest.

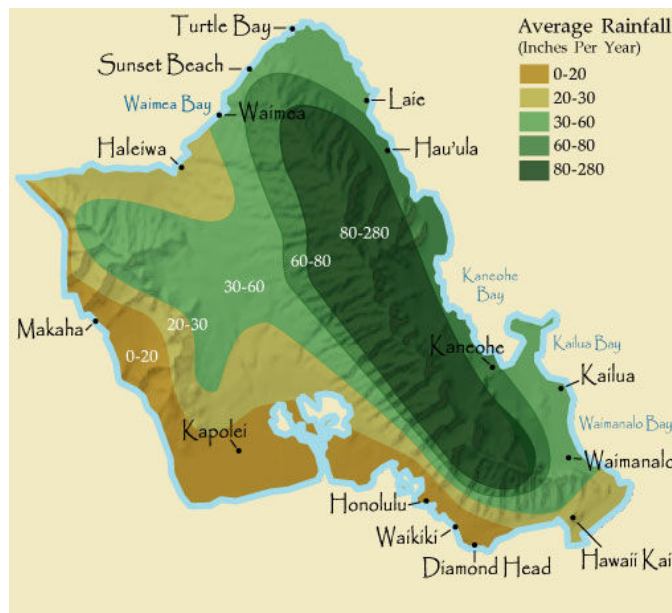


Figure 90. Annual rain fall diagram. source. <http://www.hawaiiigaga.com/WeatherGuide.aspx>

Kapolei is located in the Ewa district of Oahu and in the ahupua'a of Honouliuli. The geology of the area is shown in the map below.

¹⁷¹ (<http://www.usclimatedata.com/climate/ewa-beach/hawaii/united-states/ushi0110>).

Precipitation

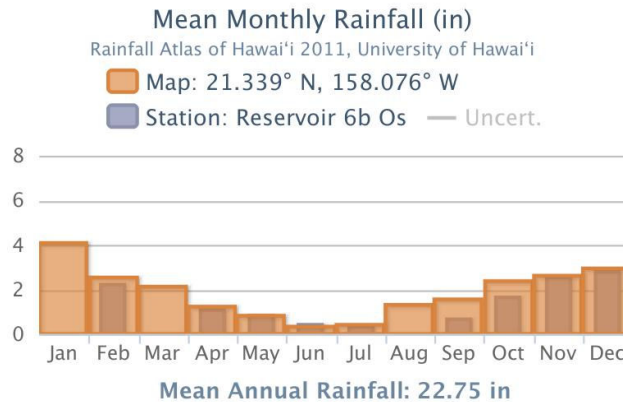


Figure 91. source: < Giambelluca, T.W., Q. Chen, A.G. Frazier, J.P. Price, Y.-L. Chen, P.-S. Chu, J.K. Eischeid, and D.M. Delparte, 2013: Online Rainfall Atlas of Hawai'i. *Bull. Amer. Meteor. Soc.* 94, 313-316, doi: 10.1175/BAMS-D-11-00228.1.>

The following graph depicts mean rainfall in a year. Accordingly, the months from October to March have more rainfall versus the months between April and September in 2011.

5.3 Cultural Characteristics

This section encompasses the historical and cultural components of the 'Ewa district, particularly the ahupua'a of Honouliuli. This is in effort to record, maintain and integrate important cultural aspects of the Honouliuli into the final design, through tradition, historical sites, stories and place names.

5.3.1 Cultural landscape - Pre contact

There are numerous mo'olelos, or stories, that depict the Hawaiian landscape before the arrival of foreigners to the 'Ewa district and the ahupua'a of Honouliuli. The name "'Ewa" means "crooked, out of shape, imperfect"¹⁷². The deities Kane and Kanaloa were well recognized around the 'Ewa area. According to Hawaiian mythology, the pair went to Oahu to mark boundaries by throwing stones; where ever the stones

¹⁷² wehewehe.org

landed become their boundary lines. After hurling several stones over the Waianae range and the Waimanalo area, one stone was thrown where neither Kane or Kanaloa could locate, hence the name 'Ewa, which could also stray, was come to be known as the place name.

The bountifulness of resources in 'Ewa could possibly be the result of the blessings given by both Kāne and Kanaloa. One mo'olelo tells of Kāne and Kanaloa being called upon by a farmer living in Wai'awa, 'Ewa, as he prepared his meal of 'awa, kalo and 'uala. He prayed to the "unknown gods" and the pair then traveled towards the surrounding hills and blessed his coconuts, fishponds and plantations.

In other mo'olelos, the 'Ewa plains are described as abundant with crops and schools of fish at sea. In ancient times, Kamakau described of a caretaker of 'Ewa, who's descendants built a heiau waihou, the type of heiau used to ask for bountiful of crops and during times of fish scarcity. After the ceremony and the placement of the kapu, and after several months had passed, schools of pearl oysters came in abundance.¹⁷³

5.3.2 Cultural landscape late 1700s-present

Late in the 1793, Vancouver observed the entrance to West Lochs and found that the flat 'Ewa plains were uninhabited with people. Although a little distance from the sea, he was told that the soil in the area was abundant with life.(footnotes Sites of Oahu) There were numerous heiaus, altars and enclosures discovered within the Honouliuli ahupua'a area. McAllister had identified that several of these Hawaiian cultural artifacts were located near almost all the Pu'u within the Honouliuli region.

¹⁷³ **Samuel Kamakau**, *Ka Po'e Kahiko: The People of Old*, Honolulu, Hawai'i: Bishop Museum Press, (1991), pg. 83.

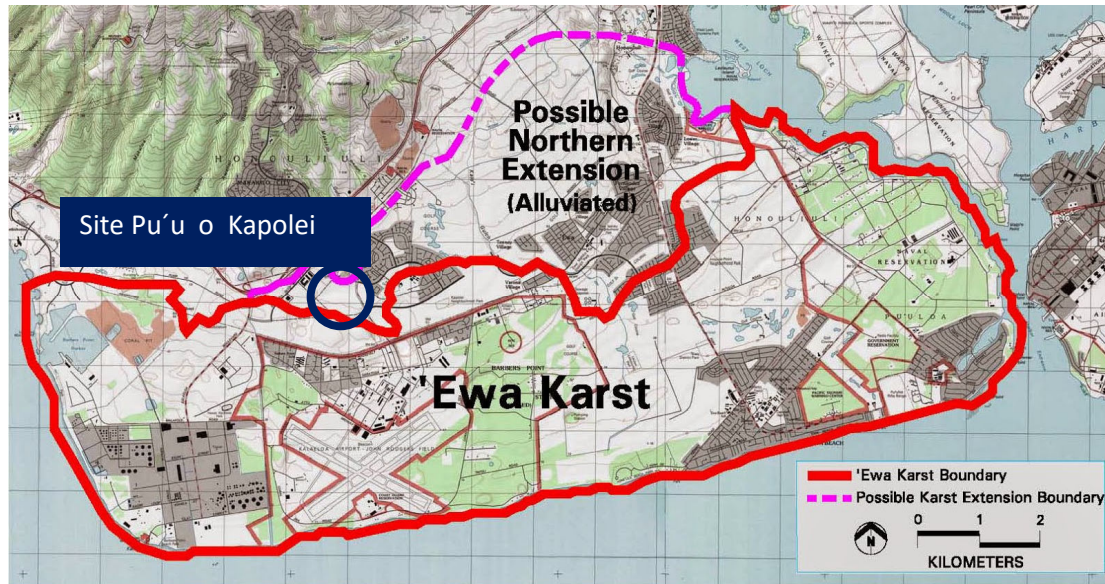


Figure 92. (<http://honouliuli.blogspot.com/2015/01/Hart-rail-disaster-hitting-Oahu.html>)¹⁷⁴

5.3.3 Karst

Karst is a landscape that is formed by the dissolution of limestone or similar. They are best known for their underground drainage system with caves and dolines, or sink holes. 'Ewa is known to have a mostly karst landscape, especially within the 'Ewa plains. Shad Kane described that the karst was an extremely important and life giving resource to the inhabitants of 'Ewa, especially in Kalaeloa. Streams would run underground and the karst provided clean, fresh water for the ancient Hawaiians from mauka to makai. Hawaiians also used karst areas for agricultural and burial purposes.¹⁷⁵

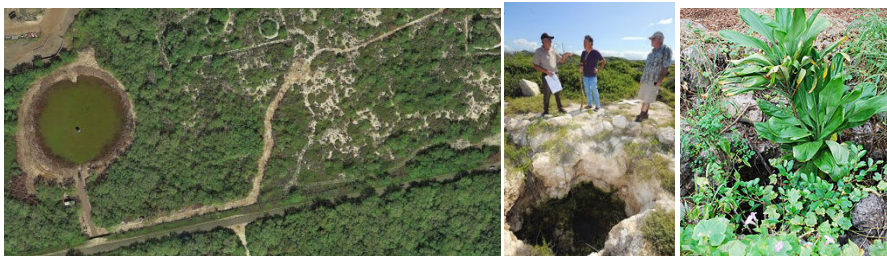


Figure 93. Karst in the 'Ewa region. source: <<http://www.koolina.com/storytellers/unearthing-the-past>>

¹⁷⁴ <http://honouliuli.blogspot.com/2015/01/Hart-rail-disaster-hitting-Oahu.html>

¹⁷⁵ Shad S. Kane interviewed by the author.

5.3.4 Plants of 'Ewa

There are numerous plants native and endemic to Hawaii and seen mostly in the 'Ewa region that can withstand the arid and dry atmosphere of the area. Of these plants is the 'Ewa Hinahina, Ko'oloaula, Wiliwili, 'Akoko, Pua Pilo and the 'Ili-ahi. These plants are considered to be threatened or endangered. Below are pictures and a brief explanation.



Figure 94

176

'Ewa Hinahina is a small shrub ranging in height between 2 to 6 feet. Uses for this plant include its potential in ecosystem restoration, especially in dry-land settings where re-vegetation is needed.¹⁷⁷ They enjoy full sun and culturally, the 'Ewa Hinahina's leaves and spikes are used in a variety of leis.



Figure 95

178

The Ko'oloaula is a shrub plant and can range to between 3 to 6 feet tall when mature. The plant grows in dry regions, open shrubby areas or forests.¹⁷⁹ The bright red flower of the Ko'oloaula makes it an attractive addition to any garden.



Figure 96

180

The Wiliwili tree grows in dry conditions with full sun light. It's seeds are popular in the making of leis. In ancient Hawaii, the wood was used in the making of surfboards because of its light weight.¹⁸¹



Figure 97

¹⁸²The 'Ewa Plains 'Akoko grows to be a height between 2 to 4 feet tall. During the dry season, the plant loses its leaves and becomes dormant for the remainder of the season. The plant

¹⁷⁶ <http://archives.starbulletin.com/2007/10/19/features/garden.html>

¹⁷⁷ http://plants.usda.gov/factsheet/pdf/fs_acsp3.pdf

¹⁷⁸ <http://www.hawcc.hawaii.edu/laurab/generalbotany/images/Ko'oloa%20ula.jpg>

¹⁷⁹ <http://www.nativehawaiiangarden.org/flowering-plants/ko-oloa-ula>

¹⁸⁰ <http://westhawaiiitoday.com/news/local-features/hawaiian-wiliwili-tree-making-comeback>

¹⁸¹ <http://westhawaiiitoday.com/news/local-features/hawaiian-wiliwili-tree-making-comeback>

¹⁸² http://www.fws.gov/refuge/Pearl_Harbor/Multimedia/Plants_on_the_Refuge.html

itself bleeds red, hence the name "koko" or blood. The plant's sap is used in paint for canoes.¹⁸³



Figure 98

184

The Pua Pilo is a small to medium wood shrub type which can grow between 2 to 10 feet. Their natural habitat is in dry areas. They make great ground covers and their white and yellow flowers bloom in the spring and summer.¹⁸⁵



Figure 99

186

The 'Ili ahi, or coastal sandal wood varies in physical characteristics ranging from being shrubby to tree. The height ranges up to 30 feet tall. The tree thrives in dry conditions and grows best in full sunlight.¹⁸⁷

¹⁸³ <http://www.nativehawaiiangarden.org/flowering-plants/-ewa-plains-akoko>

¹⁸⁴ http://nativeplants.hawaii.edu/plant/view/Capparis_sandwichiana

¹⁸⁵ http://nativeplants.hawaii.edu/plant/view/Capparis_sandwichiana

¹⁸⁶ http://memory.hawaii.edu/object/Santalum_ellipticum_feature.html

¹⁸⁷ http://nativeplants.hawaii.edu/plant/view/Santalum_ellipticum

5.3.5 WWII Fort Barrette

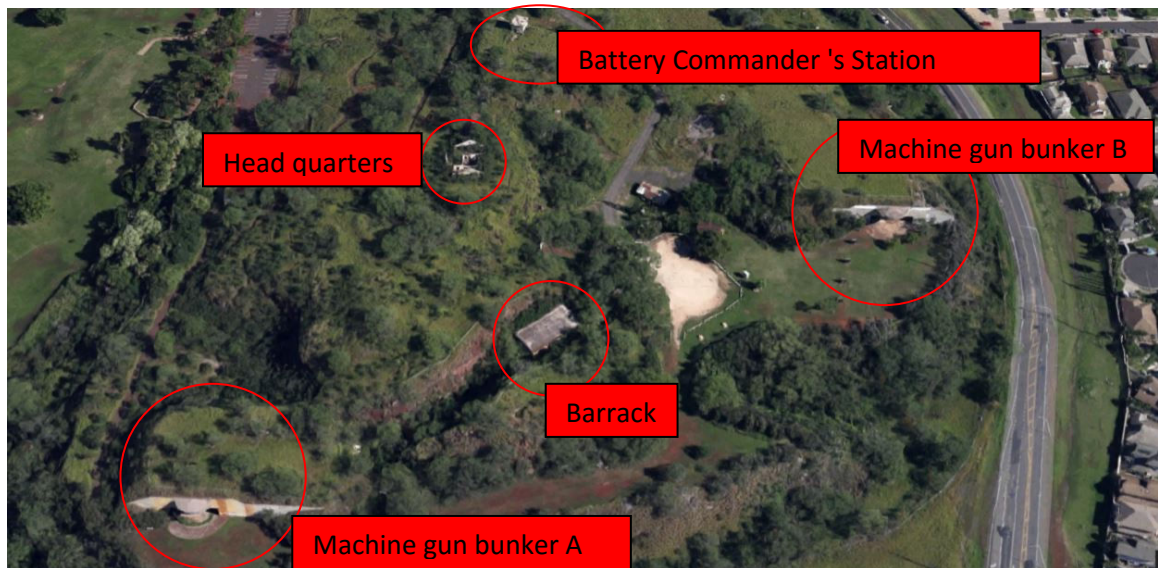


Figure 100. Birds eye of Pu'u o Kapolei source: Google maps.

During the height of World War II and the attack on Pearl Harbor, the U.S. army built bunkers all around key spots of the Hawaiian Islands. Of these key spots was Pu'u o Kapolei. There are two machine gun bunkers on the east and south side of the hill and a head quarter and barracks building at near the top. There is a battery commander's station near the entrance of the fenced gate. The remnants of this past military location are now protected under historic preservation laws.

5.3.6 Stake holders of Pu'u o Kapolei

The prominent stakeholders that come to mind when thinking of Pu'u o Kapolei is the Bushwacker Archery Range and Kapolei Civic Club.

Archery Range

Currently, atop Pu'u o Kapolei is inhabited by archers who frequent the area during open hours, which on the weekends is from 9am to 5pm and is open to the public. There are pathways and shooting targets that these archers would go to throughout Pu'u o Kapolei.

Kapolei Civic Club

The Hawaiian Civic Club has been successful throughout its tenure. It has created successful programs, built committees and created events that instill and encourage the Hawaiian grass roots movement created by Prince Jonah Kuhio in 1918. Not too long ago, the Kapolei Civic Club built a hula mound at the base of Pu'u o Kapolei in honor of the hula goddesses Kapo and Laka. The mound was designed in a manner which aligned it with the Waikiki Aquarium, Pu'u o Kapolei and Pu'u Pala'ila'i on May 2, the beginning of the dry season¹⁸⁸ displayed in figure 101.

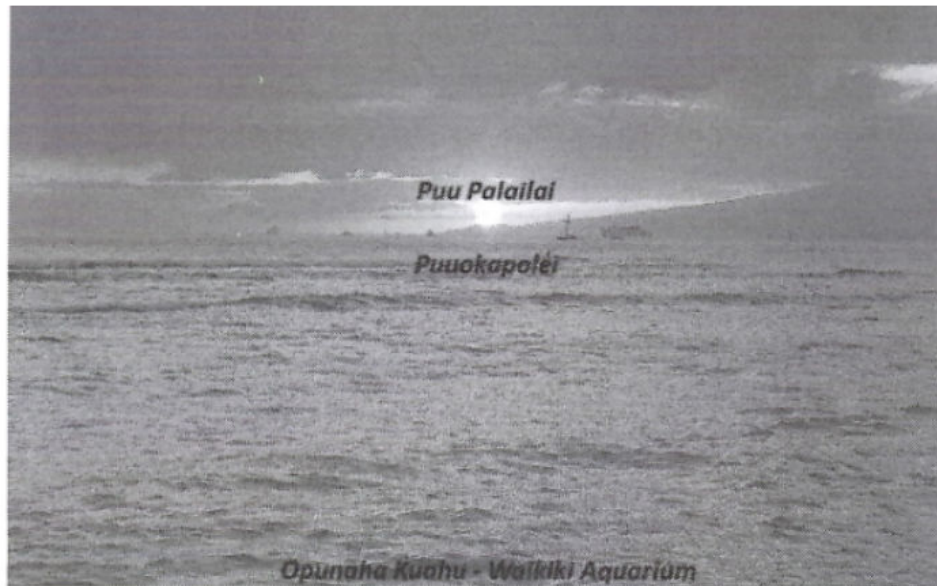
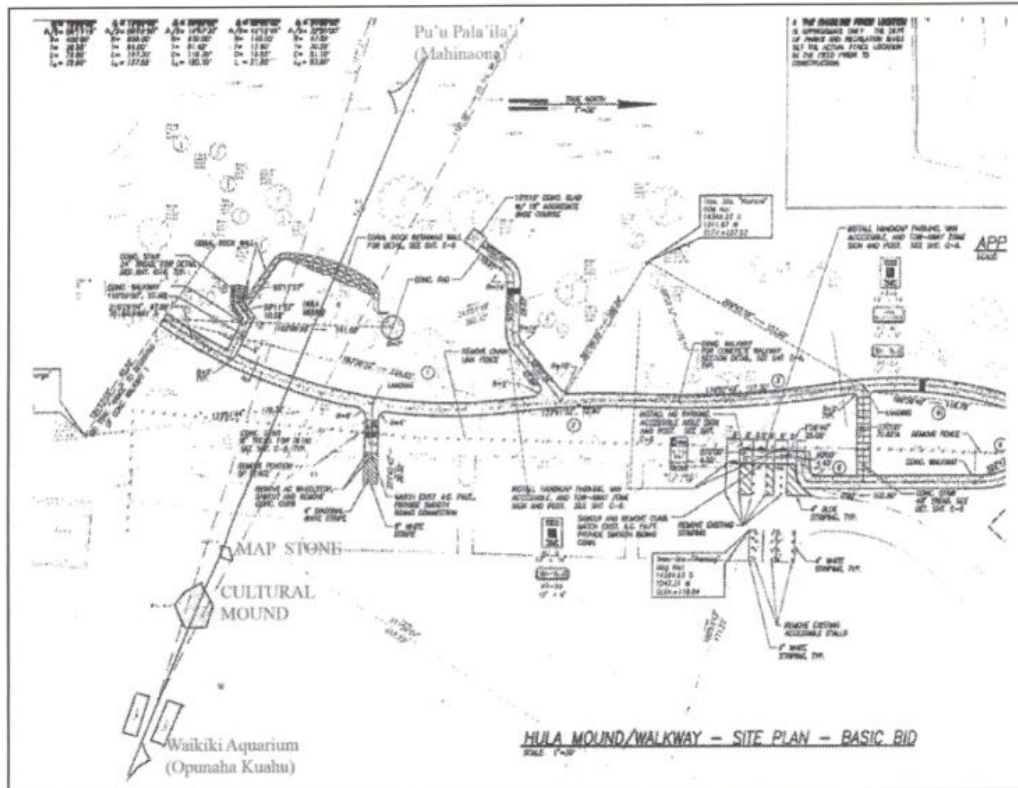


Figure 101.¹⁸⁹

¹⁸⁸ Shad Kane, Cultural Kapolei, pg. 137

¹⁸⁹ Shad Kane, Cultural Kapolei, pg. 33



Architectual design of the hula mound with integration of the lineal relationship of the setting sun over Pu'uokapolei in Pu'upala'ila'i as observed from the Opunaha Kuahu in Waikiki.

Figure 102. Architectural design of the hula mound.¹⁹⁰

5.4 Site Location

The proposed site is a 71 acre park, specifically Kapolei Regional Park located in Honouliuli Ahupua'a of the 'Ewa District, O'ahu. The goal of this design is to take the lessons learned from chapters one, two and three and use them as a tool for analyzing and developing a design concept for the appraisal and including of the cultural, physical and historical aspect of Pu'u o Kapolei.

¹⁹⁰ Shad Kane, Cultural Kapolei, pg. 34

The area of the project is located in the Kapolei region adjacent with Makakilo, Kunia, Kaleloa, Ko’Olina and the ‘Ewa villages. The majority of the area surrounding Pu’u o Kapolei is residential, institutions and businesses. Roads such as Kamokila Blvd, Farrington Hwy, Fort Barrette Rd., Kama’aha ave and Manawai St. hug the site's perimeter.

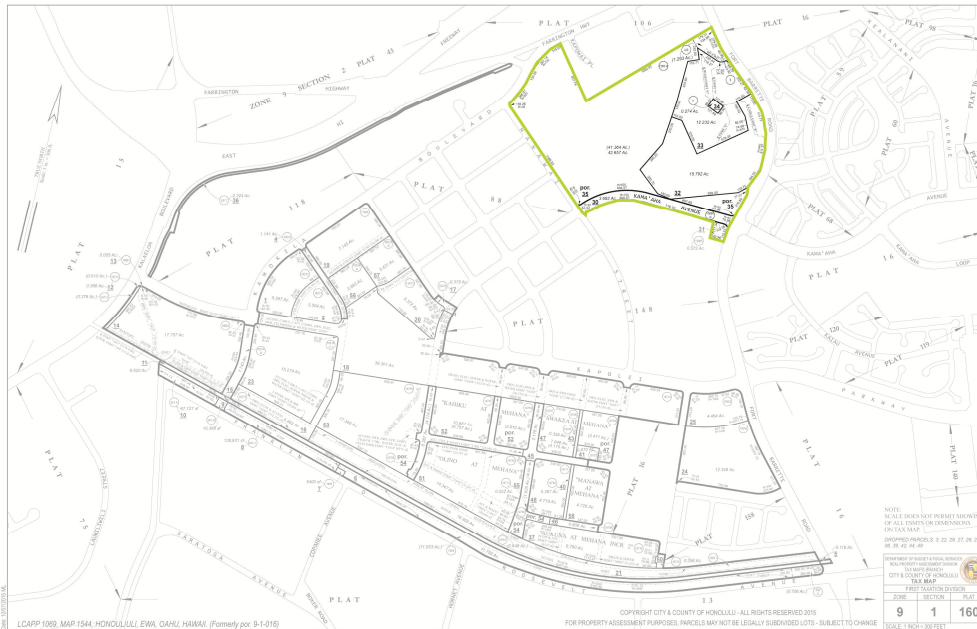


Figure 103. Plat map showing proposed site highlighted in green.¹⁹¹

¹⁹¹ http://gisftp.hicentral.com/Taxmaps_pdf/Zone9/images/O91160.PDF

Zoning (Regulatory Frame Work)

Pu'u o Kapolei Site Analysis:

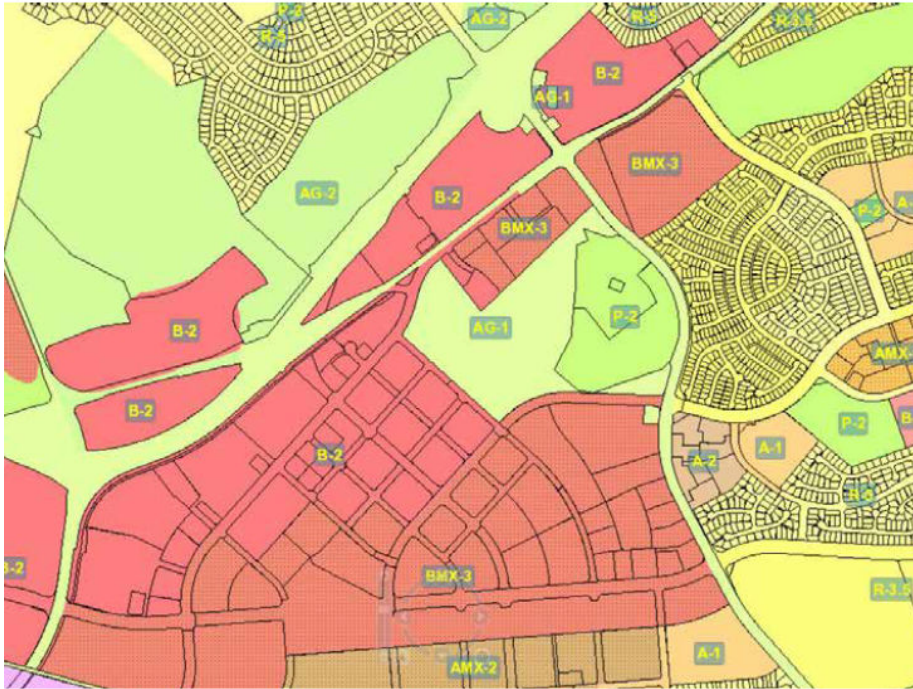


Figure 104. source : <http://gis.hicentral.com/>

Land Use Ordinance + Zoning:

AG-1	Agricultural Restriction
P-2	Preservation
BMX-3	Business Mix-used
B-2	Business Community
AG-2	Agricultural General
R-3.5	Residential
A-1	Apartment Low-Density
A-2	Apartment High-Density

The design shall comply with Honolulu Planning and Permitting codes and regulations. The zoning parameters of the site are agricultural restriction and

preservation. This translates to programming of agricultural purposes and the restriction of destroying or modifying historic buildings within the designated zoning areas. The surrounding areas are a mix use of business and residential.

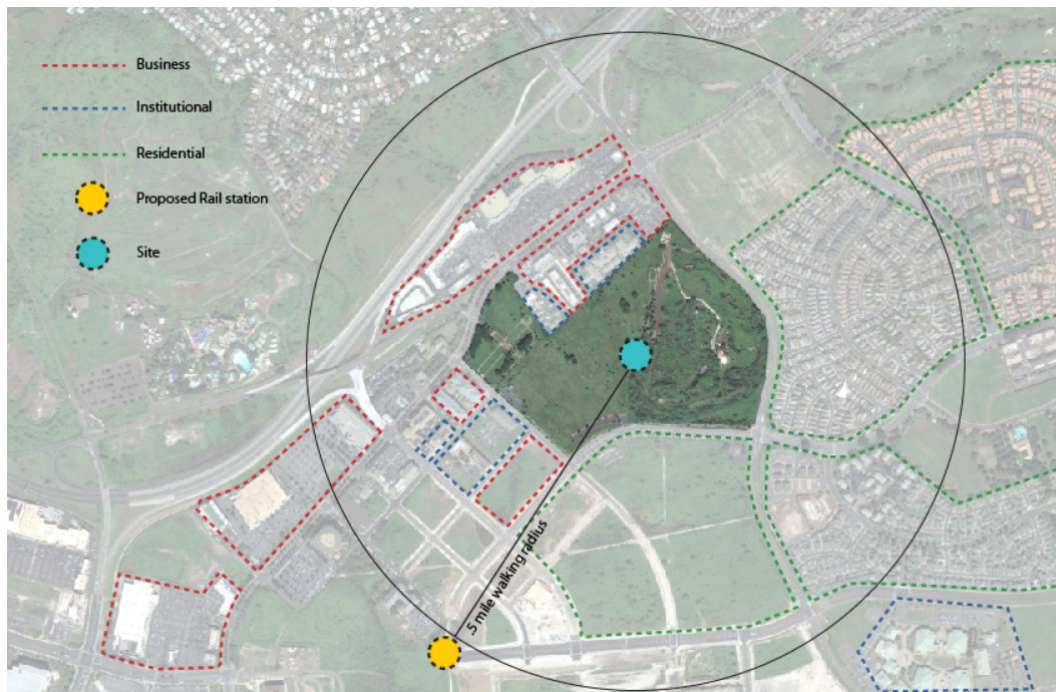


Figure 105. 2001 map and existing and future conditions . source: Google earth . Labeling and diagramming by author .

The majority of zones are residential, business and educational which are adjacent to the site. There are empty lots on the southern end of the site which will be developed into housing and apartment units. For future transportation rail, colored in blue in the graph above, the site meets the ideal walking radius of half a mile. There is a bus line on the northern western tip of the site.

Development of Kapolei is occurring at a rapid pace. Developers designed a master plan, shown in figure 106 which showcases new units near and around Pu'u o Kapolei. The rail transit design, as shown figure 107, is also a key component of the development of Kapolei.

5.5 Schematic Design

While walking the site of Pu'u o Kapolei, there appeared to be three zones which I've identified, Zone 01, Zone 02 and Zone 03, which were based on the current program that existed there.

These are three zones of the site:



Figure 108. Zones as per analysis of the site.

Current condition Zone 01:



Figure 109. Pictures of Zone 01

Zone 01 appears to be an unfinished civic space that has great geometric design but lacks the vitality and activity of a successful public space.

Current condition Zone 02:



Figure 110. Pictures of Zone 02

Zone 02 has sweeping uneven hills and vast fields for soccer season, but lacks activity in the majority of the park, especially during soccer off-season. Current condition Zone 03:



Figure 111. Views towards the neighboring hills from on top Pu'u o Kapolei, Zone 03.



Figure 112. Panoramic view of the educational space from on top Pu'u o Kapolei, Zone 03.

Zone 03 is the location of a skate park, a restroom and an archery range which is located on Pu'u o Kapolei. The archery range park is only open during the weekends, leaving the weekdays unproductive.

Site Constraints and Challenges

At the site, the main challenge is getting people involve and interested to perform activities within this large piece of land. Zone 01 has a large area, but the space is not utilized to its full potential. Zone 02 has uneven hills and flat soccer fields, but lacks the

ability for civic activities such as walking and bike riding. Zone 03, as mentioned previously, is only open during the weekends and only for archery. There is great potential to create activities within these spaces that utilizes and maximizes the time usage per week.

Site Opportunities:

Key adjacent buildings such as schools or nursing homes provide an opportunity to design a program around it. There are many businesses north of the site, making a walk to the park an ideal way to pass time. The picture below demonstrates how the adjacent buildings could be a part of the park and create activities based on the program of these institutions.

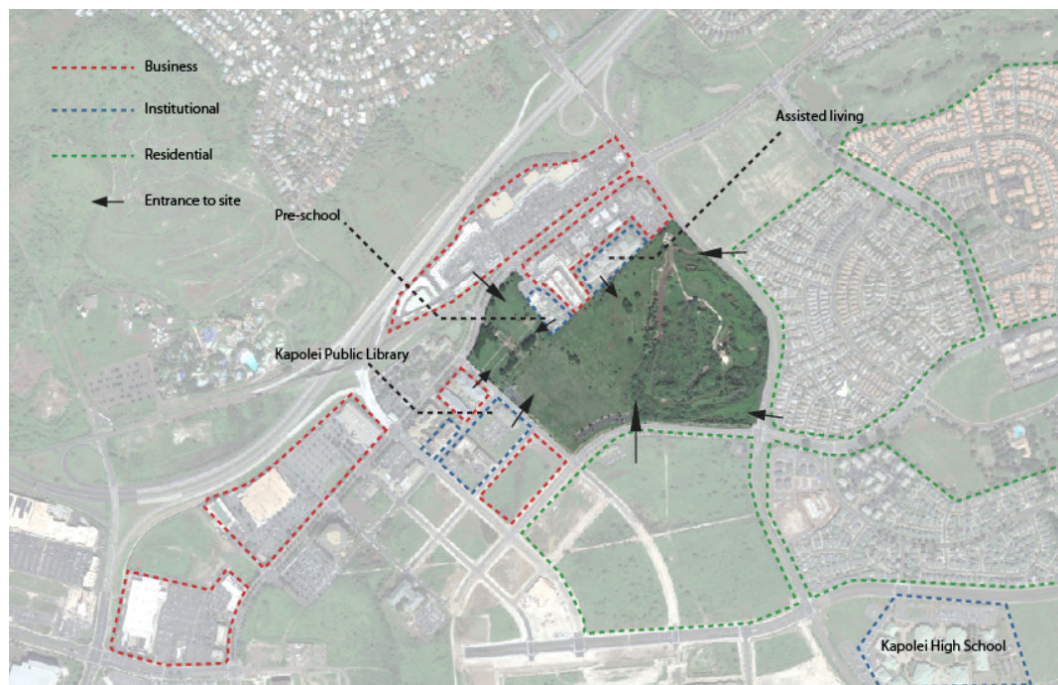


Figure 113. Key adjacent community members towards site.

Goal:

The goal is to create a self-sustainable environment that both Hawaiians and Non-Hawaiians could relate to, while at the same time uplifting and recognizing Hawaiian culture and indigenous cultures worldwide.

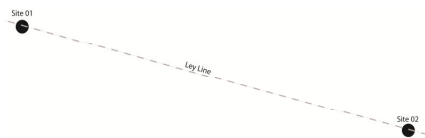
5.5.1 Spatial Programming

Plant Nursery
Educational gardens
Open Farmers Market open daily
Agriculture
Civic center/multi-functional space
Native gardens for endangered Hawaiian plants
Reflection space

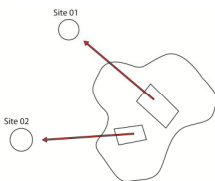
5.5.2 Design elements

A civic space is an extension of a community and provided it is designed properly, can become a great communal space that is enjoyed both day and night. The concepts and design elements that get integrated into the design, contribute to educating the community. Below is a culmination of ideas from chapter 1,2,3 and 4 and applying it towards the design opportunity of Pu'u o Kapolei. Figure 112, applies the Hawaiian concept of Papakūmakawalu in a mind mapping exercise, thinking holistically that every element are dependant to one another.

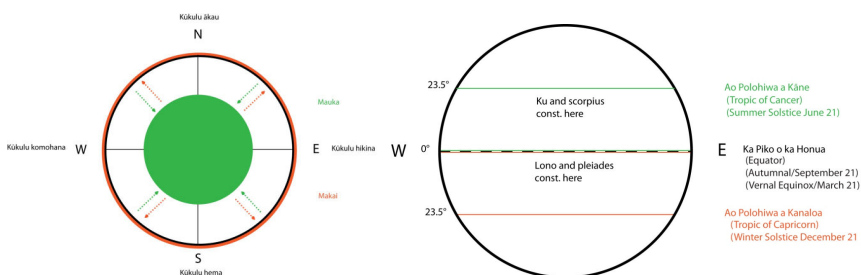
Ley Line and the connection of key sites.



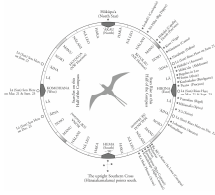
Alignments towards important sites.



Cardinal direction orientation and the Hawaiian seasons in correlation to the dieties.

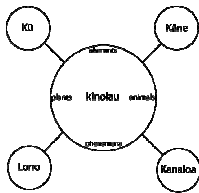


Hawaiian navigational compass

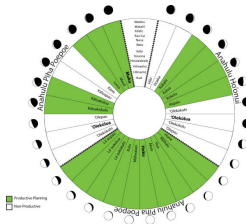


source: http://pvs.kcc.hawaii.edu/ike/hookele/on_wayfinding.html āū

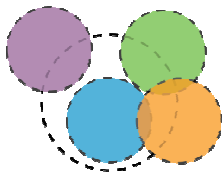
Hawaiian concept of the kinolau



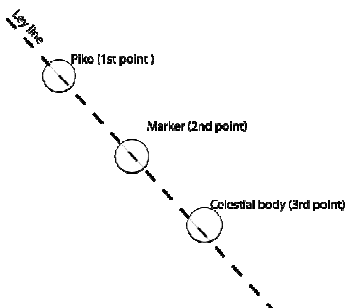
Moon cycles and planting



The multi-functionality of a space



The three points of alignments



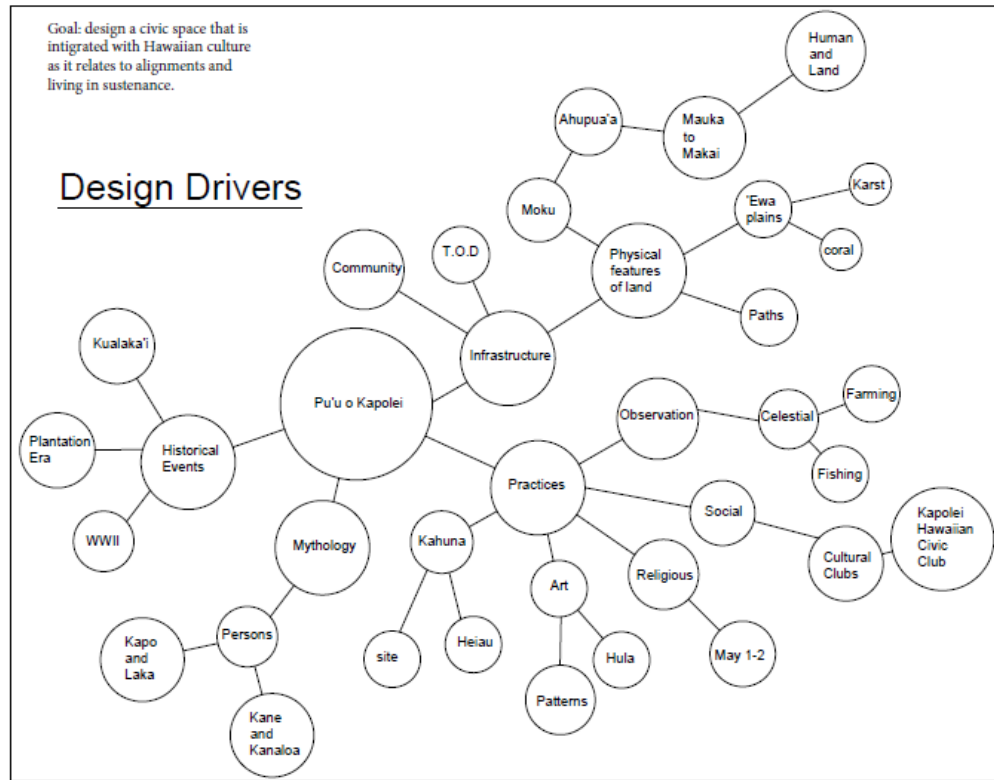


Figure 114. Like the holistic concept of Papakūmakawalu, I begin to mind map Pu'u Kapolei to create programs and design drivers.

5.6 Schematic Design: Program and alignments

The following spaces are created in relation to the alignments of the summer solstice, winter solstice, vernal and autumnal equinoxes and the May 1st alignment. Concepts of Hawaiian alignments, which are the seasonal changes, correlate with the major dieties of Kū, Lono, Kāne, Kanaloa and their kinolau. Seasons also dictates the type of Hawaiian plants that will be cultivated.

5.6.1 Summer Solstice Alignment Educational Program

Kū's Sanctuary + Canoe and Native Hawaiian Gardens

The Hawaiian deity Kū is considered to be the main Hawaiian god. As the protector, he is the god of war and politics. His manifestations consist of coconut trees, the ohi'a lehua, ulu (bread fruit) and the koa tree. During the Summer Solstice, ancient

Hawaiians would worship the God Kū, especially the Hawaiian chiefs. Kū's sanctuary was a meditative space that users could enter and experience the essence of the god's physical and spiritual form.

Another program located in the educational field is the Canoe plants and Native Hawaiian gardens. Since Ku is the god of farming, fishing, bird catching, canoe building and an overall protector of the area, it made perfect sense to create a garden that displays canoe plants and native Hawaiian plants that are widely utilized. Visitors here will learn about the different uses of such plants and how to best utilize them.

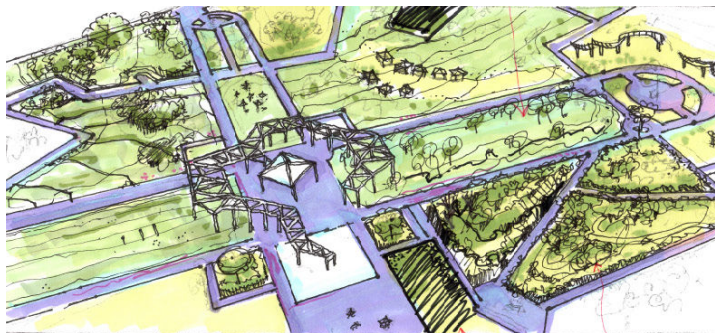


Figure 115. Kū's native garden sanctuary and nursery.

Plant Nursery

The plant nursery is ideal for learning how to propagate certain plants and nurture them. The main idea of this nursery is to allow children to participate in the outdoors and experience hands on an educational class room. However, this plant nursery is not limited to children and is open to the public. University of Hawaii students and especially encouraged to visit. The opportunity of linking the plant nursery to the University of Hawaii West Oahu is great, since they are within a few miles proximity of each other.

Hawaiian Healing Gardens

Adjacent to this healing garden is the assisted living company, making the placement of this program near where people need it the most. The healing garden comprises of a pond with native Hawaiian medicinal plants. The practice of medicine and

plants was the norm in ancient Hawaii. For this contemporary healing gardens, the sensory vocabulary of the plants and the gardens, complete the concept of a heiau that was built for healing.

Storage/ Historical building

Pu'u o Kapolei has a history of being a place of structures. In the ancient past, a heiau was built on the Pu'u and in WWII, machine gun bunkers and military buildings were built and still exist in the area. Tours can use these buildings as reference to the history of WWII. Some of these structures can also be used as storage for harvested plants and Hawaiian articles and/or artifacts.

5.6.2 Autumnal and Vernal Equinox Alignment Program

Wiliwili Sanctuary

In ancient times, the 'Ewa plains were plentiful with the wiliwili tree. With their orange colored flower and the uniqueness of the tree's living conditions, the dry region of Kapolei creates an ideal condition for the wiliwili. The value of having a wiliwili sanctuary allows the user to acquire knowledge of the tree, how it is cultivated and what it is used for and provide education before embarking on the journey atop Pu'u o Kapolei. The wiliwili blooms in the spring through the summer, then flowers again during the late summer through fall.¹⁹² The view of orange flowers from a distance during the autumnal and vernal equinoxes creates a truly beautiful sight to be seen.

Hawaiian agricultural food plants

In ancient times, Hawaiians observed the dry and wet seasons and planted certain agricultural food plants that best thrived in the season that they were in. The Autumnal and Vernal Equinox mark the beginning of the wet and dry seasons. To prepare for the dry season, ancient Hawaiians would cultivate dry plants and the same is true with wet plants as they embarked towards the wet season. This program allows the users to

¹⁹² http://nativeplants.hawaii.edu/plant/view/Erythrina_sandwicensis

experience the types of plants best planted within the proper season and how to use traditional techniques when doing so.

5.6.3 Winter Solstice Alignment Program

Kane and Kanaloa's sanctuary

Kāne and Kanaloa were a known pair to roam the southern side of 'Ewa, spreading abundance of crops and rain within the area. This sanctuary provides important knowledge regarding the pair and their physical manifestation. The winter solstice, being the wet season, references both Kāne and Kanaloa as deities symbolizing water.

Lono's Sanctuary

Lono, the god of agriculture, is worshipped in the Makahiki season. In times of agricultural hardships, Hawaiians built an agricultural heiau, or māpele, worshipping Lono in hopes for abundance of crops. During the wet season Lono showers his blessings with many crops. Lono's sanctuary provides knowledge about his physical manifestations and mythological stories.



Figure 116. Lono's Sanctuary Plan view.



Figure 117. Lono's Sanctuary section view.

5.6.4 May 1st and May 2nd alignment

During the day of May 1st during sunset, one can see the sun setting on the crown of a the hill, Pu'u pala'ila, at a distance from the Waikiki aquarium. During the days of May 1st and 2nd, the sunset is aligned with Pu'u Pala'ila, Pu'u o Kapolei and Diamond Head. The Kapolei Civic Club, built a hula mound to celebrate the start of the Hawaiian dry season and the hula goddess Kapo. During this alignment, Hawaiians would celebrate this special day by simultaneously performing hula at the mound, in Pu'u o Kapolei and the Waikiki Aquarium.

5.6.5 Pu'u o Kapolei Top of Hill

On the very top of Pu'u o Kapolei, sits the piko of the pu'u. As the user makes their ascendant through the forest of native and endemic Hawaiian plants, they enter into this sacred space. The user enters this space towards the piko and is surrounded by boulders that represent markers of the seasons and celestial bodies. Pebbles are the ground cover and create a meditative experience as a person walks through and the sounds of the stones crackle under their feet. The layout of these boulders is derived from the Hawaiian navigational star compass. Users are able to pin point the ley lines of important stars and planets through the connection of the three points. The space is also a calendar which the users can determine which types of plants should be cultivated particularly for that season.

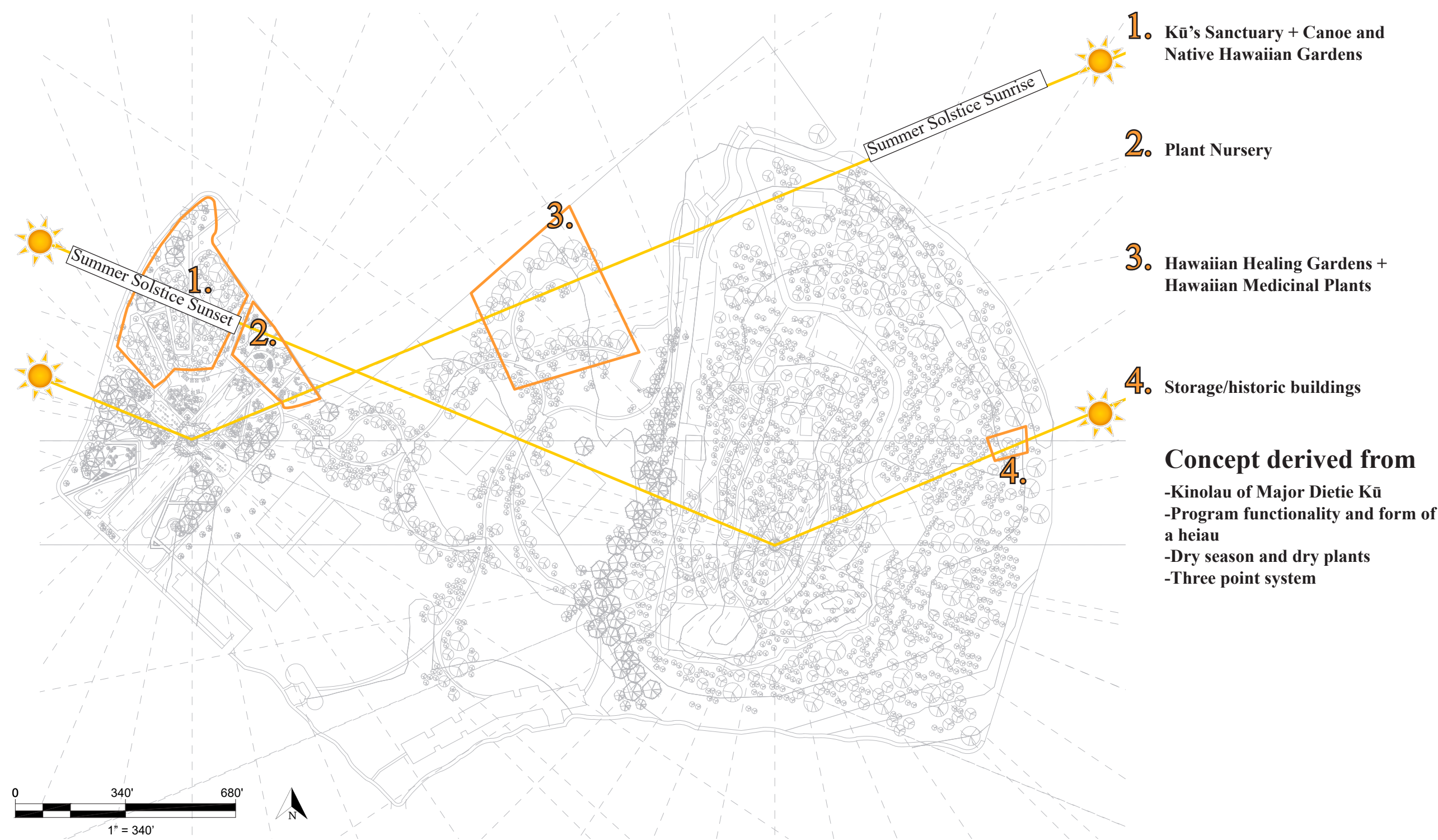
The type of activities that can occur here applies one's mind into the alignments of the stones. This means that a person can begin to piece together what they learned from zone one and zone two. There are five main alignments that happen throughout the year. These are the winter and summer solstice, the autumnal and vernal equinox and the May first alignments that pin point the seasons.



Figure 118. Pu'u o Kapolei top of Hill.

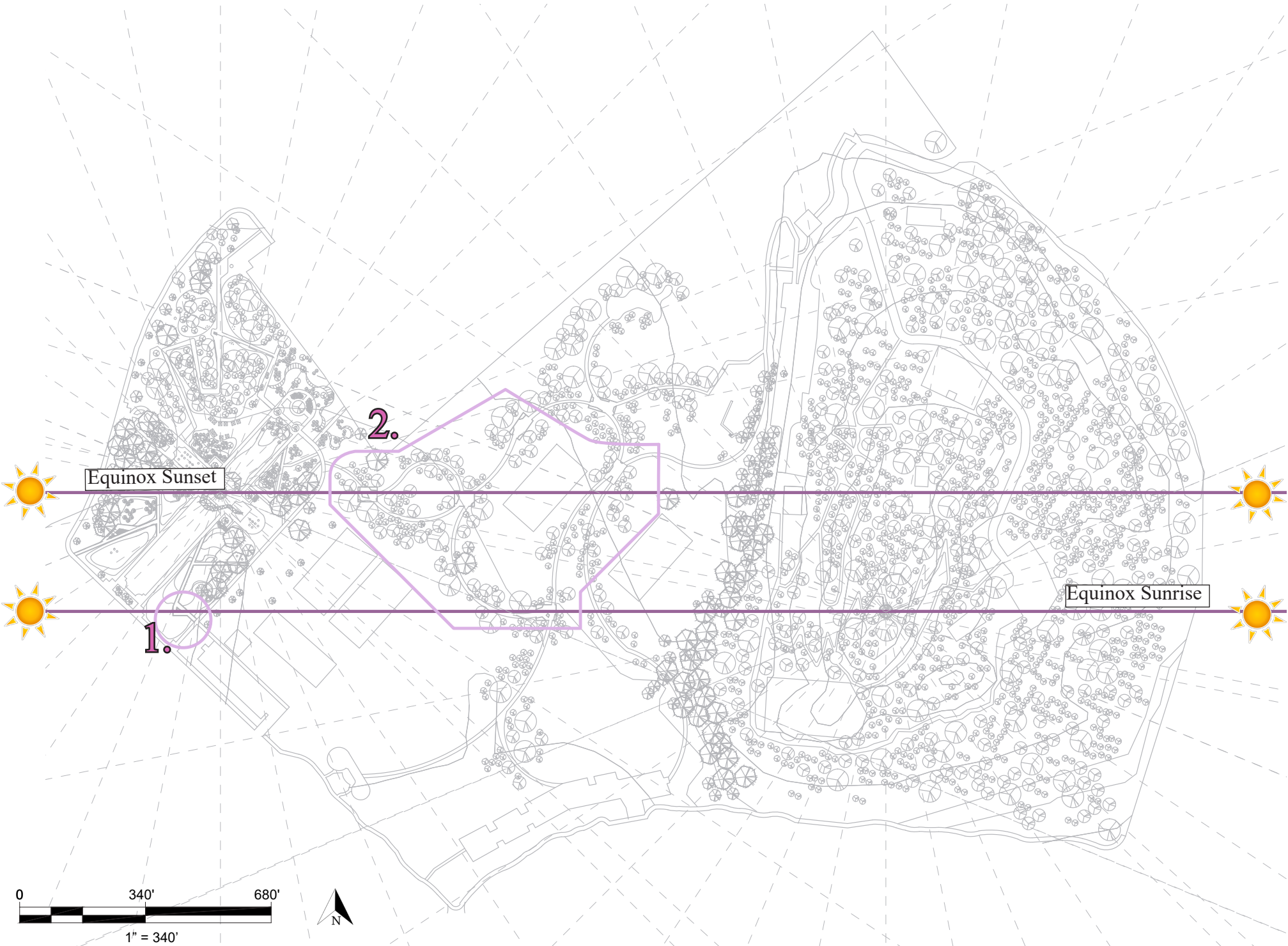
On-site : Summer Solstice Alignment and Programming

Programs



On-site : Autumnal and Vernal Equinox and Programming

Programs



1. Wili Wili Tree Mini-Sanctuary

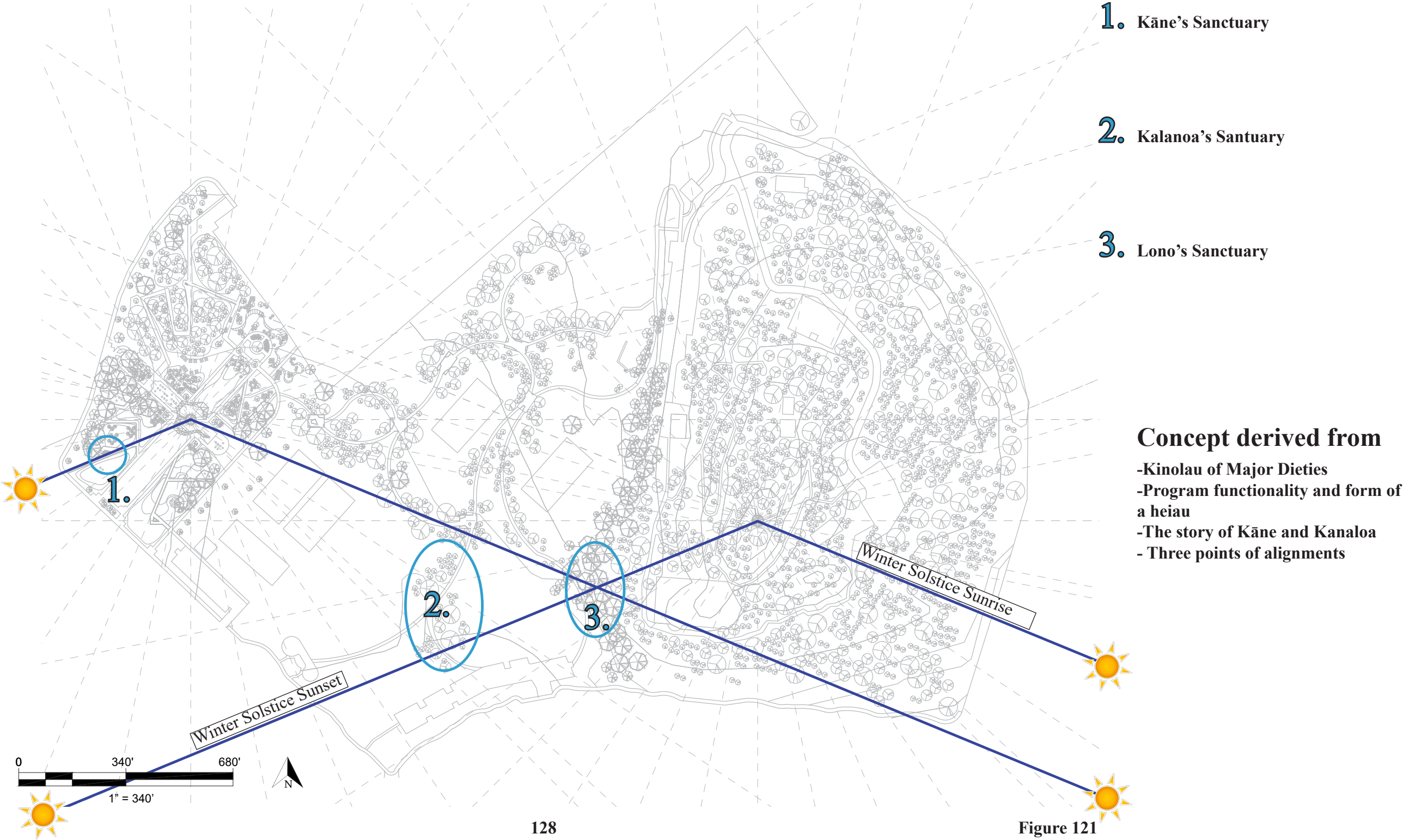
2. Hawaiian Agricultural Food Plants

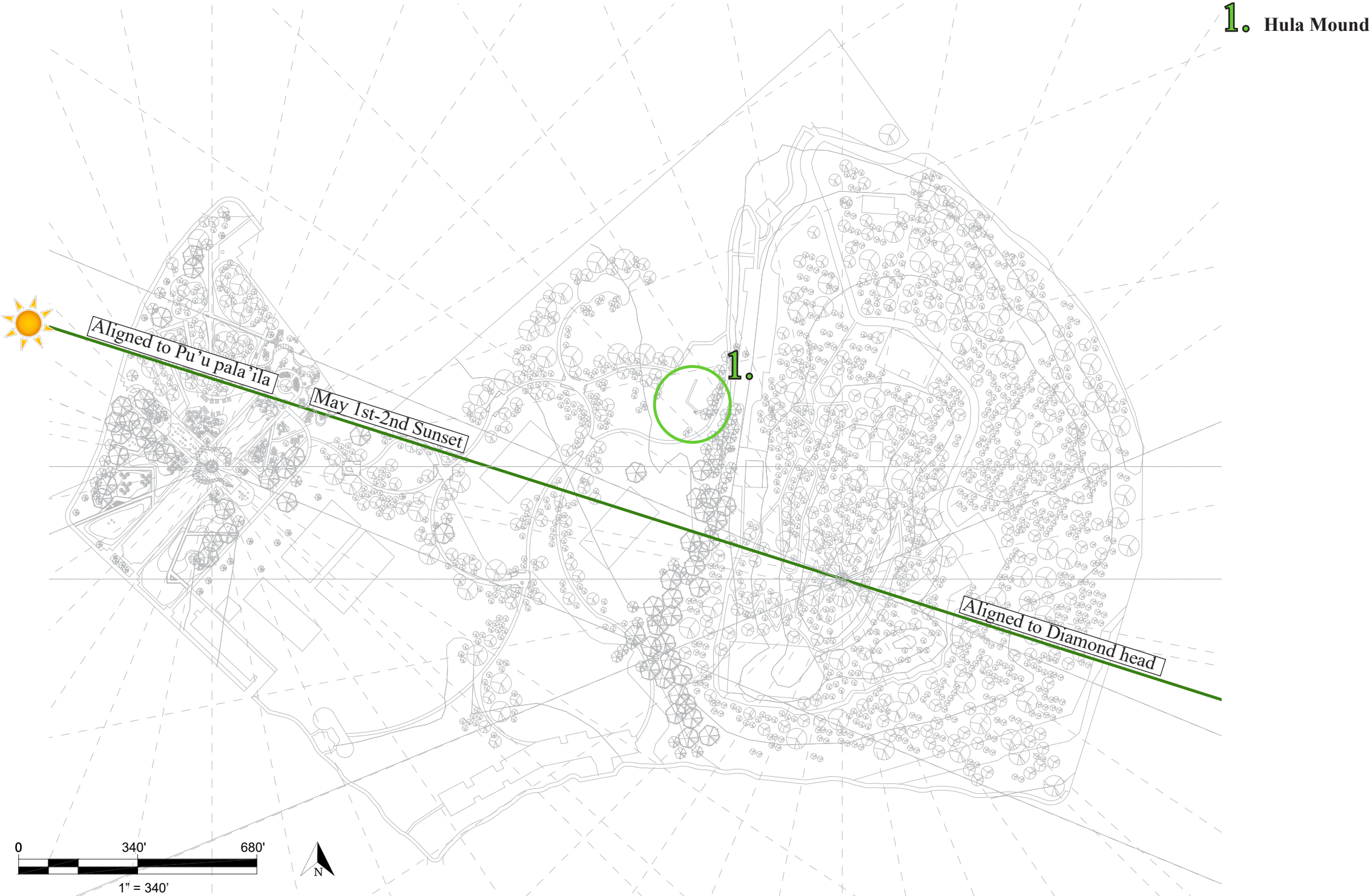
Concept derived from

- Seasonal plants and self sufficiency
- Program functionality and form of a heiau
- Wiliwili seasonal blooms

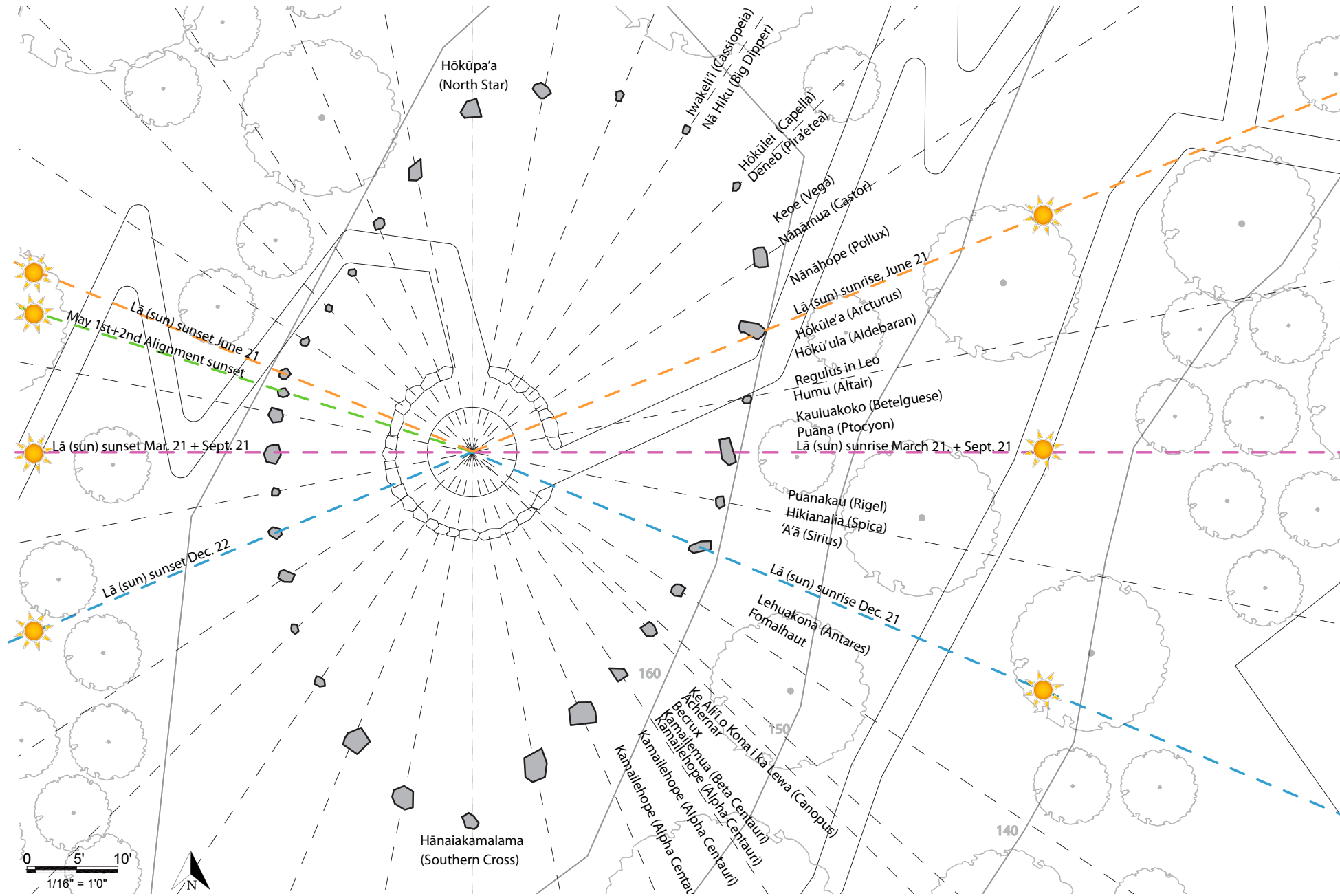
On-site : Winter Solstice and Programming

Programs





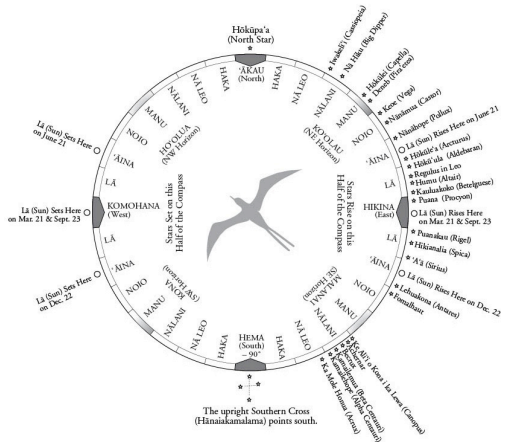
Pu'u o Kapolei Program Diagram



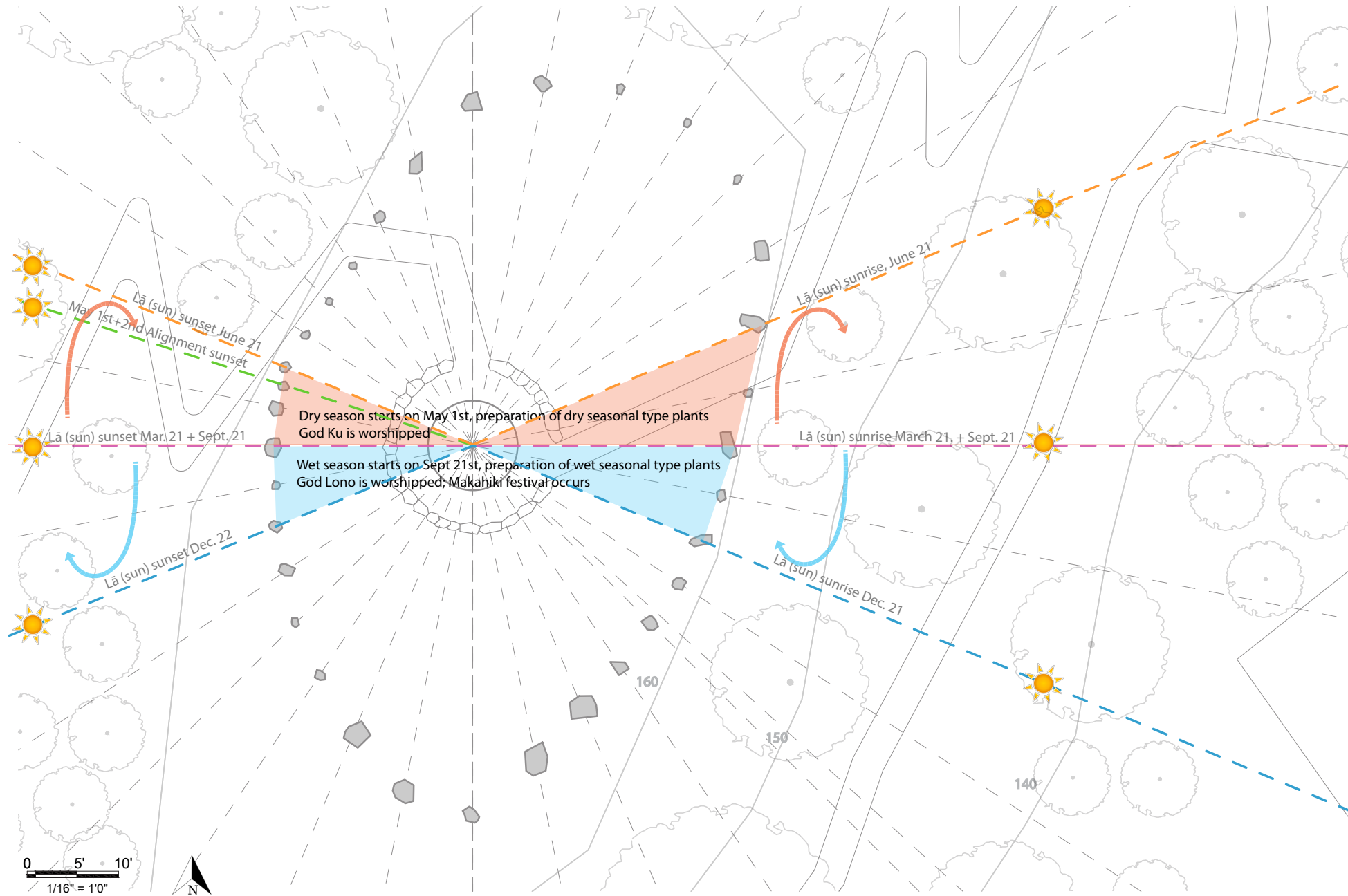
Programs

1. Sun, Moon, Star Constellation observation

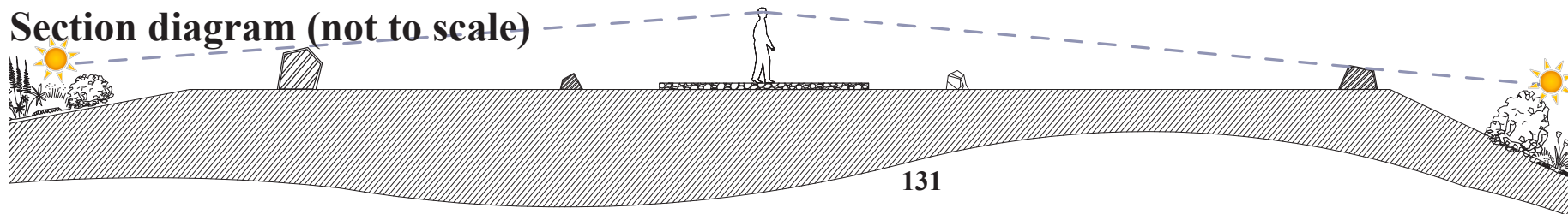
Concept derived from -Hawaiian Navigational Star Compass



Pu'u o Kapolei Program Diagram



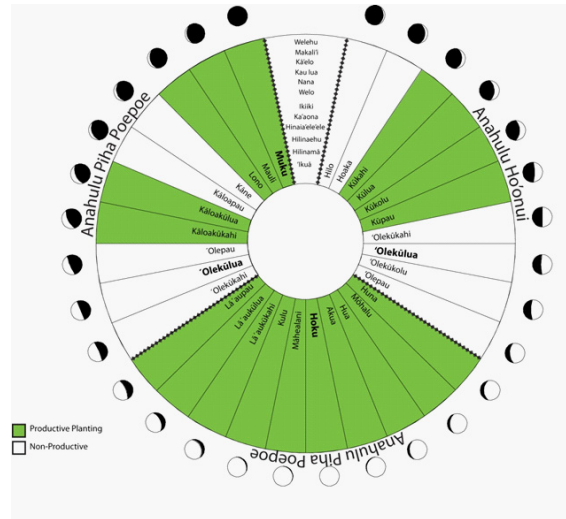
Section diagram (not to scale)



Programs

Seasonal calendar for planting

Concept derived from
-Hawaiian Moon Phase and planting



-Hawaiian seasonal changes

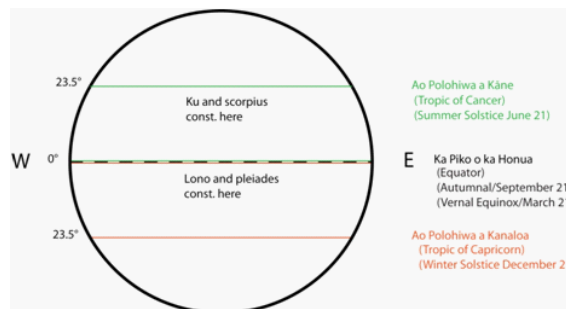


Figure 124

Master Plan



Master Plan - Zone

Zones



- 1. Educational Space
- 2. Agriculture grounds
- 3. Place of Refuge and Celestial observation

Figure 126

Master Plan - Circulation



- Existing pathways
- Proposed pathways
- Emergency vehicle access
- Bicycle pathway
- Gateway entrance
- Entrance

Note: All pedestrian pathways are ADA accessible

Figure 127

Master Plan - Proposed and Existing Structures



Proposed Structures



Existing Structures

Figure 128

5.7 Pu'ū o Kapolei opportunities

Pu'ū o Kapolei has a rich cultural history and should be made well known in the form of design. With the development occurring in Kapolei, there is an opportunity to design a civic space that emphasizes the Hawaiian culture. It's quite ironic that Pu'ū o Kapolei in the past was an important monument and today, it is most notable as grounds for archery range practice. Given the opportunity, it is practical to relocate the existing archery to a different location and allow Pu'ū o Kapolei to be open to the proposed design as a sacred space, an endangered species sanctuary and a refuge for the community.

There is also an opportunity for this civic space to be the center of community activities and a place where leaders of the Kapolei community begin to emerge. The Hawaiian plants and cultural activities that occur in the space provide valuable education for the children within the Kapolei community, for they are the ones to become leaders of the next generation.

5.8 Conclusion

This research design project will contribute to designing public spaces catering to various types of design fields in architecture, landscape architecture and urban planning. The over arching lesson learned and taken away from the reader are the understanding of a civic space and how integrating Hawaiian culture and indigenous cultures in general, within the space, provides members of the community with useful information and tools for self-sustainability.

To the designers, this research project introduces concepts of Hawaiian alignments within the civic space. The master plan has three zones pertaining to education, agriculture and spirituality. Linking the programs and activities that correlate to alignments, provides the designer an opportunity to establish those zones towards a space within an urban setting with a strong indigenous historical setting.

But more importantly, the Hawaiian and non-Hawaiian communities to reemerge and recognize the importance and knowledge behind the ancient Hawaiian culture, sustainability and environmental practices. In contemporary living, the design of a

Hawaiian civic space at the Pu'u o Kapolei will epitomize the ideology of self sufficiency, where the children, their parents, the community and the state can all work together as one to represent Hawaii as a resourceful nation.

This research project presents a great opportunity that can be the start of a new development strategy in Kapolei, where the civic leaders rise up to adhere to the need for a civic space in which to celebrate the rich Hawaiian history in Kapolei, with Pu'u o Kapolei as the piko; the heart of the community.

Appendices

Pictures on Pu'u o Kapolei by Author





Glossary

ʻAe kai - water's edge

Ahu - altar, mound

Aina-land

Aliʻi - chief

Aliʻi nui - supreme ruling chief

Ao - Lightness, enlightened

ʻApaʻa - grasslands

ʻAumakua - family guardians, family god

Awawa - valleys

Fale - a Samoan house type

Fale tele - Samoan round house

Fale afola - Samoan long house

Haka - empty

Heiau - a place of worship pre-Christian era

Heiau ipu-o-Lono - an agriculture heiau that is often seen near sites of crop production for the purpose of crop and plant abundance.

Hina - Hawaiian goddess; female

Hōkūleʻa - double hulled canoe replica of ancient Polynesian voyaging

Hoʻoilō - the wet season

Huna - hidden

Lono - one of the four Hawaiian major gods; associated with agriculture, peace and the Makahiki

Kahakai - the coast

Kahawai - stream flowing from main source

Kahuna - priest, master

Kalo - taro

Kanaloa - one of the four Hawaiian major gods, associated with the ocean, paired with the god Kāne

Kanaka maoli - a Hawaiian person

Kāne - one of the four Hawaiian major gods, associated with the ocean, paired with the god Kāne

Kapu - taboo, prohibition

Kinolau - physical manifestations

Koʻa, a - shrine consisting of piles of coral or stone placed in a circular fashion, built near sources of fish such as ponds, streams and oceans.

Koʻolau - windward side

Kū - one of the four Hawaiian major gods, associated with the dry season and war

Kuhikuhi puʻuone - a Hawaiian architect, who help designate a site for a heiau

Kūkulu hikina - east

Kūkulu komohana - west

Kūkulu hema - south

Kūkulu ākau - north

Kumulipo - Hawaiian creation chant

La-sun

Loa - long

Luakini - war temple, dedicated to Kū

Mahina - moon

Makahiki - Hawaiian new year

Makai - ocean

Makaliʻi - Pleiades star constellation

Mānaiakalani - Scorpius star constellation

Manu - bird

Māpele - agriculture temple, dedicated to Lono

Marae - a meeting or communal place for social purposes

Mauka - inland

Mo'olelo mo'okū'auhau - genealogical stories

Mo'olelo - stories

Muliwai - water that flows slowly

Nā Leo - the voices,

Noio- Hawaiian tern seabird

Ole - bad not good

Pā'ao - a kahuna kuhikuhi pu'uone from Samoa; mentioned in Polynesian mythological stories

Papa-meaning flat surface, symbolizes the female

Piko - center of origin, center, umbilical cord

Pō - Darkness, realm of the gods

Pohaku - stone

Po'owai - source of a stream

Pu'u - high places or hill

Uala - sweet potato

Wahi pana - sacred places

Wākea - meaning sky, symbolizes the male and is the sunshine and rain that fertilizes the seeds

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